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Tansley Harrow is a member of the Veterinary Services Department at Alderley Park. A graduate of the Royal Veterinary College, London, he joined Pharmaceuticals Division in 1946 after several years in private practice and with the Agricultural Research Council. Has been concerned in the development of many of ICI's veterinary products, in connection with which he has travelled extensively. His total flying mileage—all on Company business—is nearly a quarter of a million miles, and he has crossed the equator 22 times and been round the world four times.

Lawrence Hogben, a New Zealand Rhodes Scholar mathematician, abandoned the hockey fields of Oxford for the navy in 1939, becoming the first naval instructor ever to win a DSC (and later the American Bronze Star). Post-war, after doing weather forecasts for industry and working for his Ph.D., he joined ICI in 1948. In Central Publicity Department he is mainly concerned with ICI propaganda in Europe, in whose languages he claims to be 4½ up, with 6½ to play.

Cedric Jagger, who is responsible for departmental services in Central Publicity Department, is also at present undertaking Mond Division's advertising liaison work in London. He confesses to being fascinated by the "armchair detective" work inseparable from any serious study of old mechanisms, but also finds time for an interest in education as a governor of a mixed primary school in his home locality.

I. H. Kendall is chairman of ICI (China). Born in Tientsin, China, he joined ICI (China) in Shanghai in 1933 after schooling in England. He was commissioned into the Royal Artillery during the war and subsequently served on the Staff, being demobbed with the rank of major. Worked for ICI in Shanghai until 1951 and in Hong Kong since then. Mr. Kendall was appointed a director of ICI (China) in 1960 and chairman in December last year, and he also serves on the Board of the Hong Kong and Shanghai Banking Corporation.

Gordon A. Teichmann graduated as a mining engineer at Birmingham University, joining ICI in 1949 in the Technical Service Department of Nobel Division. He is at present seconded to Southern Region on special duties. Has made a particular study of geophysics and visited seismic prospecting operations all over the world.

Front cover: *Inspecting parts of pressure lanterns made from ICI brass.* (Photographed by courtesy of the Yue Kee Metal Mfg. Co., Hong Kong)

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A seismic "shot" is fired in the North Sea. ("Shell" photograph)

Oil under the North Sea

by Gordon A. Teichmann

Reports in the press and on television will have stimulated curiosity about the seismic prospecting now going on in the North Sea, while the recent announcement that ICI has joined a consortium with the Burmah Oil Co. Ltd. and Murphy Corporation will have added to this curiosity. Why the sudden interest, and what are they really looking for? Moreover, what is seismic prospecting, and how does it operate?

The story starts many years ago—about 150 million—when England, Holland and parts of Germany were below the water to form a much vaster North Sea than the one today. During this time, silt, sand and decayed vegetable and animal life were deposited on the shallow sea bed by the major European rivers, such as the Rhine and the Elbe, and over the remaining aeons were compressed, contorted and buried under thousands of feet of rock so that the carbonaceous material was formed into oil.

Oil, and the gas which is usually associated with it, are of basic importance to industry today. ICI, for example, uses oil both as a fuel to generate power and as raw material in its own right. The complex of chemical plants at Wilton depends almost entirely on a steady flow of petroleum feedstock, and industry as a whole and chemical companies in particular will depend increasingly on cheap sources of oil and natural gas. The new naphtha reforming process developed by ICI is likely, on account of its cheapness, to make significant inroads into the present coal-based gas processes, which together consume about 40 million tons of coal a year.

This huge increase in demand by Britain for power and raw materials was well illustrated by Sir William Penney, the chairman of the Atomic Energy Authority, who recently pointed out that electricity demand is doubling every nine years while the figures for 20–30 years ahead were almost beyond belief.

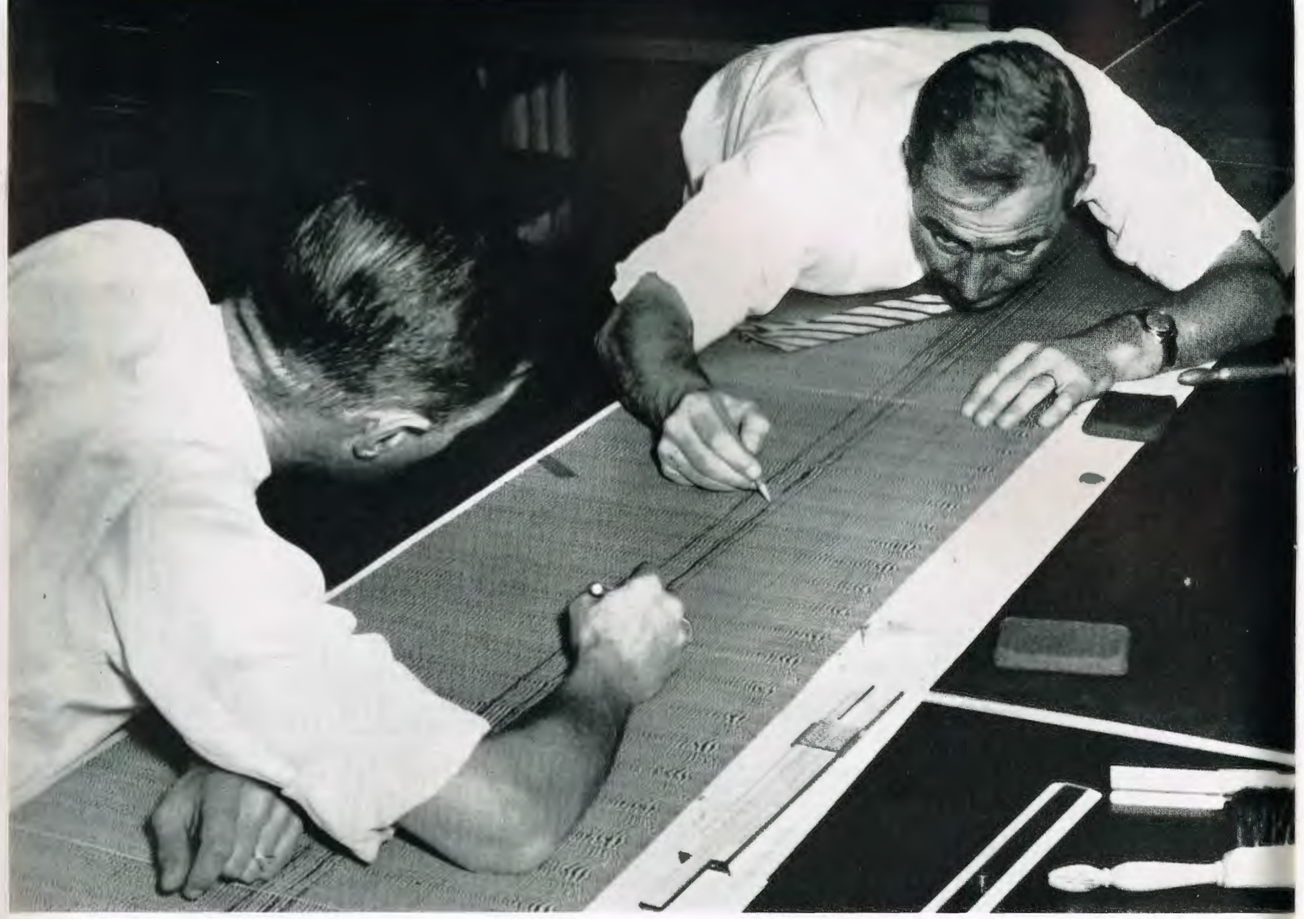
Neither coal nor nuclear power can be expanded fast enough to meet this need, and the bulk of the increase will have to be supplied by oil and gas.

Expansion of power and raw material requirements applies all over Europe, and as nine-tenths of its oil requirements are imported, searches nearer home become politically and economically more vital. This makes the North Sea area, right on our doorstep, extremely attractive.

The possible presence of oil and gas in this area was worked out many years ago by oil company geologists. However, it can be appreciated, particularly by those who have sailed across the North Sea on a rough day, that drilling holes in to the crust of the earth through 200–300 ft. of heaving water on the offchance of finding oil would be far from simple, as well as being extremely costly. In any event, finding a big oilfield, which would only be a mile or two across and at any depth from several hundred feet to two miles or more, would make hunting a needle in a haystack child's play, even on land, ignoring the technical difficulties of drilling in deep water.

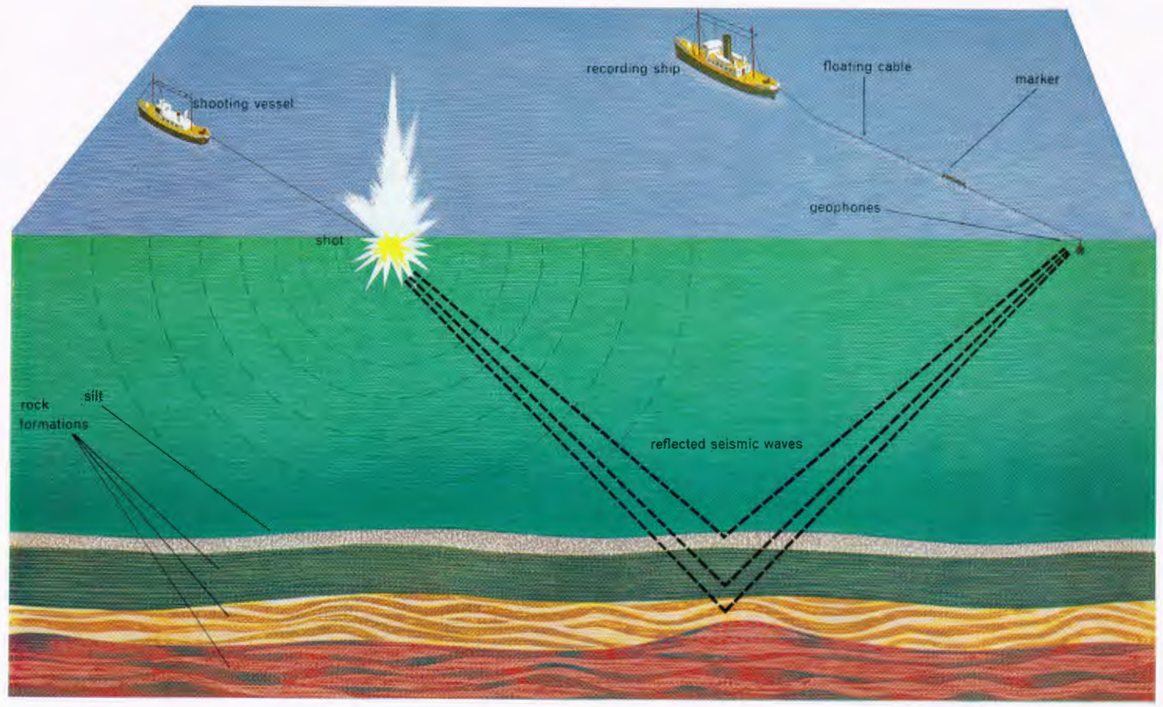
The outcome was that the geologists passed the problem to the geophysicists, whose job it is to map underground rock structures, and they started on the land bordering the North Sea areas.

Some useful structures were found in the 1930s, and the oil well drillers struck oil in Britain at Eakring, near Nottingham. Rather more was found in deposits in



Two seismologists interpreting seismic recordings made during the North Sea survey

Shock waves travelling from the shot are reflected by the rock layers and picked up by the geophones. The geophones relay this energy to the recording ship where the seismograph recordings are made



Germany and some in Holland, but overall the picture was not particularly encouraging when compared with other propositions in other parts of the world. Certainly it did not warrant surveying and drilling holes in the bed of the North Sea, which even with the present-day improved techniques of drilling in deep water might cost up to £1 million per hole.

Geophysical surveys and drilling were continued in Europe but more concentrated activities were undertaken elsewhere, with very gratifying results and the location of some enormous strikes, one recent major field discovery being the Zelten fields in Libya and another in the Persian Gulf at Abu Dhabi.

As already mentioned, natural gas is usually found with oil, in which it readily dissolves, but little use can be made of it unless it is near a large population, so though we in Europe use vast quantities of oil from overseas until recently not much natural gas, except from one field in the Pyrenees, called Lacq, and from the Po Valley was used. Then a drilling crew working on a European prospect hit a tremendous strike at Slochteren near Groningen, Holland. This deposit has since proved to be the second biggest in the world and quite capable of supplying a big slice of European gas supplies for many years.

A discovery of this size triggered off world-wide interest to the extent that last year at least twenty-five oil companies, including all the major ones, started a huge search for further supplies of gas and oil in the North Sea. This spring these same oil companies have mounted an even bigger search, the largest group being a consortium of B.P., Shell and Esso, while the companies with which ICI is associated form a group not much smaller.

Each group of companies employs a specialist geophysical company to do the prospecting, and these in turn (and there are at least fifteen company crews working) carry out the survey from small ships of 600 tons or so, sailing along predetermined lines accurately plotted by Decca navigational instruments.

They are first mapping thousands of feet of rock structure below the sea bed, because oil in economic quantities only accumulates in domes of rock covered with an impervious layer. To do this they fire explosive charges generating miniature earthquakes, the energy waves from which are reflected off the rock beds below, much like light impinging on a mirror. These waves are picked up by sensitive recording instruments and the results photographed. By measuring the time taken for the ground waves to reach the instruments (geophones) it is possible to map these rock layers for a depth of two or three miles and obtain an indication of the existence of domes which might contain oil.

The same system of firing charges is used on land or at sea, but in the latter case prospecting can be carried out very quickly. One ship steams along at 4–6 knots pulling behind it a series of geophones, each geophone being suspended from a floating cable, while a second ship generates the earthquakes by firing at 2½ minute intervals 50 lb. charges of explosive, to a time accuracy of at least 1/1000 second. The returning seismic waves are photographed and tape recorded over several seconds, giving a most complicated pattern of oscillating lines, showing peaks at reflections from rock interfaces. Each recording is separately interpreted by scientists, many of whom are in London or The Hague.

In order to provide the right shock wave at this fine interval of time, Nobel Division have developed special grades of explosives and highly accurate detonators, allowing them to obtain the great majority of the business from the prospecting companies operating in the North Sea.

Most of the material used is Marine Seismex packed in tin canisters of up to 50 lb. in weight. Because of the large quantities of explosive carried on board ship this grade of explosive has to be very safe, and it is so insensitive to shock that under normal conditions it will not detonate until a Nobel Booster is used in conjunction with the detonator.

This concentrated geophysical survey may take years, but once some mapping has been completed—probably by next year—the first drilling can start, and then it will be known whether the Dutch discovery will become part of an even larger European oil and gas reserve, the products of which can be piped all over Britain. The economic repercussions of such discoveries could be immense in the next five to ten years, and even the present Dutch find is likely to materially reduce the cost of gas in Europe.

Until May of this year anyone could have drilled for oil outside British territorial waters, though at the same time they would have had no rights either, so if one oil company had found oil, a "free-for-all" could have developed to no one's advantage. Fortunately, the United Nations held a conference on the law of the sea in 1958 at Geneva, and one of the subjects was the Continental Shelf Convention. The Continental Shelf is considered as the area of sea bed offshore from the world's continents to such a depth as will permit of the development of its natural resources (usually about 650 ft.). This includes all of the North Sea.

The Convention deals with the division of this shelf between the countries bordering it and their exploitation rights. It was necessary for twenty-two countries to ratify this convention to bring it into force. Twenty-one nations have already agreed and, with Britain, this has now been ratified.

The prospecting area for Britain is 100,000 square miles, broken into 100 square mile blocks, and British nationals or British companies can apply for licences. Twenty to 25 concerns, of which ICI is one, have indicated their interest. Successful licensees are expected to have their designated area awarded by September, and then they can carry out full-scale investigations.

What are the chances of success? No one can tell until the crews actually hit a gas or oil deposit, but the initial signs are certainly encouraging.

Opposite page: Composition, by Jean-Paul Riopelle

Moving the Net, Portugal, by Harold Beament

Winter Figure, by Donald Jarvis

Three Plants, by Kazuo Nakamura

The C-I-L Art Collection

by W. H. Craig

An art collection, consisting of the best available works of some of Canada's most distinguished contemporary painters, has been compiled by Canadian Industries Ltd. Some 40 paintings by 31 artists were selected in 1962 for the collection, which has prompted considerable interest in cultural and business circles in Canada.

The C-I-L Art Collection is a stimulating group of paintings ranging from the figurative to the abstract and it is representative of present-day painting in Canada, though it is not intended to be a complete survey of the field. It is a "living" rather than a museum type of collection, since it is purely contemporary, and in the years ahead, as new artists appear and as older artists acquire new techniques, the collection will be extended and varied so that it will remain representative.

The 40 paintings originally selected for the C-I-L Art Collection were chosen from a much larger group of paintings drawn together by Evan H. Turner, director of the Montreal Museum of Fine Arts and chairman of the jury which made the final selection. Other members were Alan Jarvis, sculptor and art authority and former director of the National Gallery of Canada; Richard B. Simmins, former director of exhibition extension services for the National Gallery and now director of the Vancouver City Gallery; W. T. D. Ross, vice-president of C-I-L; and P. C. Allen, a deputy chairman of ICI, then president of C-I-L.

According to Dr. Turner, quality was the sole basis of selection by the jury, whose aim it was to acquire the best possible group of paintings by living Canadian artists. In discussing the method of selection, he said, "The Company's decision to have a jury with the majority of its members professional people in the art world, rather than a jury of company officials, assured greater objectivity in selection."

In recent years in Canada a number of other major companies have also provided encouragement to Art. For the most part, this encouragement has taken the form of the commissioning of works of sculpture and painting for new industrial and commercial buildings and to add interest to the interiors of new office buildings. Some companies have initiated noteworthy art collections for this purpose, and their collections have received public attention.

The C-I-L Art Collection is an interesting departure from the usual theme because its principal purpose is not decoration and adornment, but public service and the encouragement of the Canadian artist. In the words of its curator, B. I. McGreevy, secretary of C-I-L, "It is our hope that the C-I-L Art Collection will help and encourage Canadian artists, as well as provide opportunities for public groups to see a good cross section of work in this field of art in Canada."

To achieve its twofold purpose the collection will be largely a travelling one, operating from its home base at C-I-L House in Montreal, where the paintings will be displayed when not on tour. Already, since its first showing in Montreal in March 1962, paintings, singly and in groups, have travelled many thousands of miles and have been exhibited in many centres in Canada and abroad.

Showings of the paintings have been held in a number of communities in Quebec and Ontario, and at the present time a part of the collection is being sent on a tour of the Canadian west. During the tour, fourteen paintings are being exhibited in public libraries, art galleries and universities in Trail, Victoria, New Westminster, Penticton and Kelowna in British Columbia; Calgary and Banff in Alberta; Saskatoon and Regina in Saskatchewan, and Winnipeg, Manitoba.

Keen interest by the public is being

Shrinkage Stope Driller, Delnite Mine, by Alan Collier

Nanaimo Boat, by Edward J. Hughes, now in the collection of Peter Allen

shown in the collection during its visits to Canadian communities, as was proved, for example, by the reception it received last year in the industrial city of Trois Rivières, Quebec. Here more than 6000 people visited the exhibition, which was also the subject of a locally organised and well-attended panel discussion in which individual paintings were discussed and analysed by local artists.

Recently ten paintings from the collection were chosen to form part of an exhibition of contemporary Canadian art at the University of Rochester, N.Y., recognised as the centre of Canadian studies in the United States. In February of this year in England Londoners saw three paintings from the C-I-L Collection—"Milk Truck" by Alex Colville, "Sky Panel" by Harold Town and "Triple Sun Panel" by Ronald Bloore—at an exhibition of modern Canadian painting in the Tate Gallery arranged by the National Gallery of Canada. Two other paintings, on loan to the Museum of Modern Art, New York, will tour the United States in 1964 with an exhibition of works by Canadian painters.

Patronage of the arts is not entirely new for C-I-L. Some years ago the company sponsored a weekly radio programme called "Singing Stars of Tomorrow" for a number of seasons on the national network of the Canadian Broadcasting Corporation. This programme provided an opportunity for talented young singers of classical and semi-classical music to appear before a wide public, in many cases for the first time. Musical scholarships were awarded to those whose performance was adjudged best by a professional jury. Some of the artists who received their initial opportunity on this programme have since made important careers in music.

The company hopes that the C-I-L Art Collection will provide a similarly useful service for Canadian painting. The two projects are not identical, since many of the artists whose works are in the C-I-L collection are already well established in their field. However, most of these are better known in the larger cities and, in some cases, even outside Canada than in the smaller Canadian centres. C-I-L's objective in exhibiting these pictures to as wide a public as possible is to foster interest in painting and to encourage a national pride in the achievements of Canada's artists.

A modern block of flats in Rome, showing the excellent use of rigid foam filled panels (Panels manufactured by Ditta Giuseppe Moneta S.p.a., Milan)

ICI and the Construction Industry

by C. L. a'Court

It is perhaps as well to explain the term "construction industry." It includes the building industry and the civil engineering industry—two closely allied but separate entities. The building industry is concerned with houses, schools, hospitals, industrial buildings, offices and the like. The civil engineering industry is concerned with such things as docks, harbours, roads, bridges and tunnels. In this country the ratio of work done, by value, is roughly 70 : 30. From the point of view of building material suppliers, a further important difference is that the building industry proper uses a much higher proportion of materials than the civil engineering industry and, in general, the latter uses the cheaper and heavier kinds. It will be appreciated that a considerable part of the work of the civil engineering industry is concerned with heavy earth movements which do not entail much use of materials other than those already on the site. However, there are certain modern developments in this field which are of interest to the chemical industry and to which reference will be made later.

Historically, the construction industry has been a user of traditional and cheap materials. These have been based very largely on natural stone, clay, chalk and limestone, sand and gravel, timber and gypsum. These have been sometimes used in their natural form and sometimes, by relatively simple processing, to form components or materials such as bricks, lime, and gypsum plasters. All of these cost something less than 1d. per lb. It may be wondered why ICI should interest itself in a market of this type, the more usual function of the chemical industry, particularly in its modern developments, being to turn to much more complex materials requiring great skill to produce, and therefore of much higher cost. The answer—which reflects the complexity and interest of the Company's concern with the construction industry—may be

The Queen's Gallery, Buckingham Palace. An Isora 'Thermalucent' ceiling, designed, supplied and installed by Isora Illuminating Ceilings Ltd., Slough, Bucks. The ceiling is about 2000 sq. ft. and made up of panels each with two detachable PVC "skins" over steel frames. The ceiling panels are made from 'Craylene' PVC film manufactured by Greenwich Plastics Ltd. from 'Corvic' ICI vinyl polymer

Bricklayers at work inside a temporary shelter provided by 'Visqueen' film

taken in two parts. First, the Company supplies these cheap basic materials in considerable quantities; second, the construction industry is changing rapidly and providing a bigger market for the advanced chemicals which ICI produces, the cost of which is commonly measured in shillings per lb. and sometimes, even, in pounds per lb.

The present role of ICI

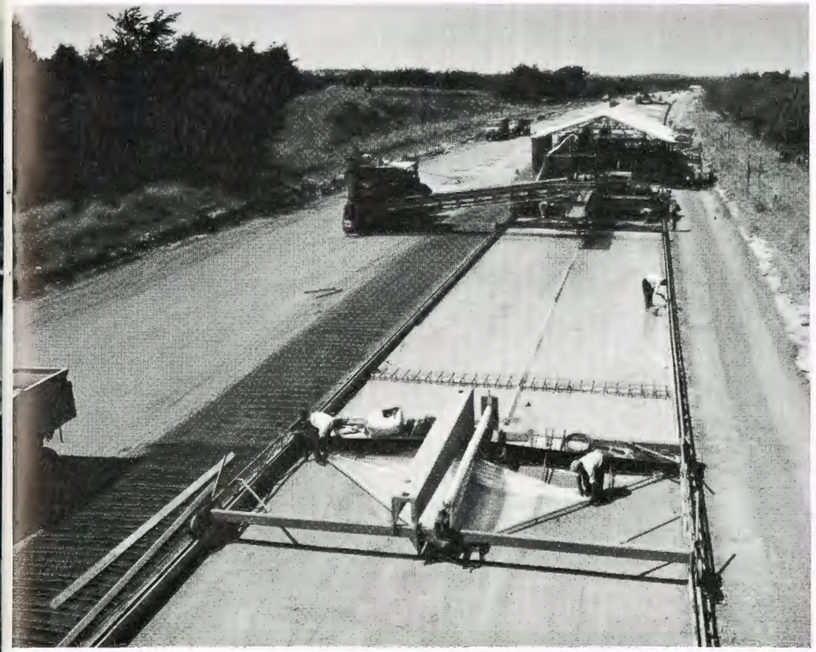
ICI is, in fact, probably the second biggest supplier of building materials in the country, but the nature of its business is quite different from that of the others. Commonly, the construction industry has been the predominant customer of the major suppliers, who in turn have tended to concentrate on one section of the building materials market. Bricks, cement and plasters are outstanding examples. By virtue of its great diversity, ICI produces a very wide range of materials. Apart from paints and non-ferrous metals, ICI has tended to be a minor supplier of any individual material, although the overall total of its contribution has been large. Also, perhaps, a greater proportion of its materials go to other building material suppliers who subject them to a further process, such as fabrication, before they appear on the building site.

Paints occupy a unique position in ICI's relation to the construction industry. Paints Division's decorative products represent nearly a half, in value, of ICI's total supplies of materials for building uses. They also represent approximately half of the total business of the Division. Yet the original companies which went to form the present Paints Division supplied very little decorative paint to the construction industry. They were more concerned with things like nitrocellulose finishes for motor cars. It was only after the formation of ICI that Paints Division became interested in the alkyd resin formulations, which led to the production of the 'Dulux' range of paints, now so much a household word in this country; and it is these which have been the primary cause of ICI taking a leading position in the decorative paint field.

The origins of the Company's interests in the construction industry could be listed under the following categories:

1. Interests from firms acquired by ICI or its predecessors for other purposes.
2. As an outlet for otherwise waste products.
3. As a minor outlet for materials primarily produced for other purposes.

Examples of the kinds of material produced by various Divisions under these categories include the following:



'Visqueen' film being mechanically laid as an underlay for a motorway

1. **Mond Division.** Limestone in various forms; 'Limbux'; rock salt.
   The former Metals Division. Copper strip, sheet and wire; copper tube; aluminium strip and sheet; aluminium extrusions.
   Paints Division. As has been said above, the well-known decorative paints could be considered under this heading.
2. **Agricultural Division.** Portland cement; gypsum plaster; gypsum plasterboard.
   Mond Division. Calcium chloride.
3. **Agricultural Division.** 'Faspos' fire retardant; 'Gammexane'.
   Dyestuffs Division. Concrete additives such as 'Lissapol' N, 'Aphrosol' FC, 'Melgan' A; resins for paint manufacture.
   Heavy Organic Chemicals Division. 'Topane' and isopropanol.
   Mond Division. Sodium silicate; 'Winnofil' S; 'Trilac'; 'Arcton' 11; hydrochloric acid.
   Plastics Division. A large number of products, including 'Alkathene,' 'Corvic,' 'Darvic,' 'Flovic,' 'Melinex,' 'Mouldrite,' 'Propathene' and 'Welvic.'
   ICI (Hyde) Ltd. 'Vynide.'

Notable items which do not come under the above headings are the various explosives and accessories which are produced by Nobel Division. For these, civil engineering and ancillary activities such as quarrying have always provided a significant outlet. In the case of Plastics Division, the building industry is an important buyer of 'Perspex.' Among the associated companies, British Visqueen Ltd. looked from the start to the construction industry to provide an important outlet for its materials, and this has been realised in practice to an extent even greater than was originally visualised. In some cases the film is used as a permanent element of construction, e.g. as underlays in road construction and as damp-proof membranes in buildings. A large quantity is used for temporary purposes, such as for keeping goods delivered on site in good condition while they are

awaiting use, and even for keeping parts of the building clean while the later trades are working. Perhaps most interesting of all is the provision of enclosures to whole buildings in process of erection, so that work can go on under any weather conditions.

The challenge of the future

The foregoing gives a partial answer to the two-part question suggested earlier, but it is even more important and interesting to consider what is happening at the present time and what future developments are likely to be.

Recently a Main Board Director has been assigned to take a special interest in the building industry. This is clearly indicative of the great upsurge of interest in the construction industry on the part of almost all Divisions and a number of our associated companies at the present time.

Reasons for this are not hard to find. Constructional work accounts for 12% of the gross national product and is expected to grow greatly in the immediate future; Ministry authorities have suggested a 50% increase in less than ten years. Secondly, the construction industry itself, pressed on by this great growth required of it, is becoming much more alive to new methods and new materials, and is looking to them to help it in the task before it. Thirdly, with general trading conditions becoming more competitive, all potential suppliers are naturally looking to such an extensive field as the construction industry as an outlet for their latest materials.

In looking to the future it may be instructive first to see how the older materials have been developed to meet this challenge.

The former **Metals Division** interests are now, of course, the concern of associated or subsidiary companies. Copper tubes and fittings have been taken over by Yorkshire Imperial Metals and have a big sale. In addition, YIM now makes plastic pipe for use in cold-water plumbing, as well as PVC rainwater goods which are likely to be used considerably in buildings of the future. Imperial Metal Industries, who are big suppliers of copper sheet and strip for roofing, are looking for new and extended ways of using these materials. Less obvious outlets offered by the civil engineering side of the industry include the use of an appropriate grade of copper alloy wire for the heating of roads at important junctions and other vital points to keep them open in bad weather conditions.

The aluminium plant is now operated by Imperial Aluminium Co. Ltd., which is very actively pursuing all outlets which the construction industry offers. One example is the recent introduction to this country of the Kalwall system of wall cladding: this is a combination of aluminium framing and translucent plastic panelling.

Agricultural Division is giving considerable attention to its position with regard to Portland cement and gypsum plasters. In the case of the latter, in particular, it has produced very successful grades of lightweight plasters which are combinations of calcined gypsum and vermiculite. Great sales progress has already been made with these and the future is felt to be bright, both for those grades which have fairly recently been brought on to the market and for others which may be developed in the future. The Division is also much interested in the extended use of plasterboard, for dry linings of houses in particular.

Mond Division is proposing to make Portland cement from its quarry waste at Buxton; in addition it is interested in extending the uses of limestone aggregate for concrete and of lime for certain forms of soil stabilisation. As road clearance and maintenance are important functions of public authority engineering departments, it is appropriate to refer to the great extensions which had been made in the salt mines at Winsford to enable the appropriate grades of rock salt to be available for snow and ice clearance. Research work on the proper way of doing this was carried out by the Road Research Laboratory with the co-operation of the Salt Group.

The activities of **Paints Division** in its own field are so wide and so well known that it is hardly necessary to stress them further, except to say that continual changes in new structural base materials and in architectural fashions present corresponding problems in paint formulation with which the Division must keep continually abreast.

ICI (Hyde) Ltd. has added 'Vynalast' and 'Vymura' to its range, the latter specifically for use as a wall covering. It has also quite recently developed a clear corrugated PVC sheet for roof lighting and other applications.

Nobel Division is active in the use of both silicones and aluminium stearate as water repellents used in various ways in building construction, and interesting work has been done in co-operation with research organisations and other commercial firms.

New developments

Of newer developments, reference may be made to the various uses of urethane foams, the basic materials for which are produced by Dyestuffs Division. The primary objective is to use foamed material as an insulant, but other forms have been developed for sealants both in buildings and in roads. Low-density rigid foam is finding wide application as the core material in sandwich structures; for example, in infill panels for curtain walling. Suggestions have also been made that high-density rigid foam, in spite of its high cost, might well have certain structural uses such as the paving of movable bridges. Because of its excellent sound-absorbing properties, flexible urethane foam also is used in building, particularly as a decorative finish to interior walls and ceilings.

Nobel Division has developed and is selling a range of plasters and structural bonding materials, with cellulose derivatives as an essential constituent. The Division is also interested in extending the uses of silicones in the construction industry. A building sealant has recently been marketed which has outstanding properties of adhesion and flexibility. It is particularly useful in modern building practice, which entails the use of moderate to large size units, especially if the buildings are tall and therefore subject to significant movement due to wind, temperature and other forces.

Agricultural Division is developing a board similar to plasterboard but having foamed urethane instead of plaster in the core. It has also produced varieties of coated plasterboard, and this activity is proceeding further, as well as other studies for the more extended use of its gypsum.

Paints Division is continually looking for new and modified materials. As an example, 'Permobel' Protective Primer may be taken. This is a zinc-rich epoxy-resin primer which, when properly applied, gives protection to steelwork much in advance of previously accepted methods of priming.

(continued on page 95)

Health service for animals

by W. T. Harrow

When I announced my intention of becoming a veterinary surgeon my grandfather asked "What does the boy want to be a b—— horse doctor for? There won't be any horses left in another twenty years!" In one respect he was very nearly right. At that time there were in Britain nearly a million horses employed in agriculture alone—now there are virtually none.

Where grandfather was wrong, of course, was that it is very many years since the veterinary surgeon was a horse doctor. We now have nearly ten million cattle, thirty million sheep and seven million pigs as potential patients in Britain—not to mention something like three and a half million dogs and at least five million cats. Poultry, nowadays very much the concern of the veterinary surgeon, number over a thousand million. And speaking of poultry, quite a lot of people call in "the vet" when their pet budgerigar falls ill!

The veterinary surgeon himself has changed quite considerably. Fifty or so years ago he qualified after taking a three-year diploma course. Now he takes a university degree the course for which is some six years—twice as long as that for an ordinary degree.

The kind of work that he does has also changed a lot. Before the first world war the great majority of veterinary surgeons were practitioners attending to the individual illnesses of their patients, which were mainly horses. Farm animals were of relatively low value, and in any case there was not a great deal that could be done for them.

Today the whole pattern has changed. We are all far better off than we were. We eat more meat and dairy produce. More of us have our own house and garden, run our own car and travel by air. This means not only that we need animals for food, but at the same time are taking up for ourselves in housing estates, motorways and airfields the fields on which those animals should be grazing. Thus the farmer not only has to keep more animals than he used to but there is less space left for that purpose.

New methods of administration ensure accurate and certain dosing

This effect is shown most clearly in the poultry industry. Until the last war most poultry were kept in open runs. By 1950 one in every ten was kept in an intensive house. Three years later more than three in ten were kept indoors, and today considerably more than half are kept in this way. With larger animals the change has been less marked, but far more cattle, sheep and pigs are being kept on much smaller areas.

In the case of dairy cows this means that instead of being able to live entirely on grass they have to receive extra food in the form of "cake." This cake does not of course contain currants and sultanas, but even so it is far removed from the grass that is the cow's natural food. It is in fact made from palm kernels, groundnuts and other tropical plants. As an additional insult to her system we now expect the cow to provide us with something like a thousand gallons of milk every year instead of just enough to feed one calf, which is all that nature ever intended. All this, of course, places a great strain on her system. In her youth she has to share her pasture with a lot of other calves, which means that she also shares their diseases. Lambs, too, are in the same predicament.

There are a number of diseases of overcrowding which have naturally become more important under modern conditions of intensive housing and grazing.

One of these—tuberculosis of cattle—has been dealt with very thoroughly by the veterinary profession. Not so long ago one cow in every three in this country was tuberculous, which meant enormous losses of milk and meat and, even more important, a grave risk to human health. Now, thanks to an energetic programme of testing and getting rid of infected animals, the disease no longer exists.

All young animals carry a certain number of parasitic worms in their intestine. These worms suck blood and therefore prevent the animal from growing as it should. When they are present in large numbers they cause illness and even death.

Each worm produces several thousand eggs which pass out on to the pasture. Most of these eggs, picked up by other calves or lambs, grow into adult worms which in their turn produce more eggs. It is easy to see that when young animals are crowded together it is not long before they become very heavily infested. Such is the effect of these worms that it has been estimated that if they could be eliminated from the world's livestock the resulting increase in human food production would be more than enough to meet the needs of the Freedom from Hunger Campaign.

Fortunately there are drugs available which enable these worms to be substantially reduced in numbers, if not entirely eliminated, and treatment goes a long way to improve the situation.

The doctors and medical research workers have been so successful in prolonging human life and eliminating epidemic diseases that the population of the world is growing at a faster rate than its food supplies. Veterinary research can put this right by controlling the diseases of animals which lead to enormous wastage of human food. I have already mentioned worm diseases. There are very many others, many of which can be controlled by the use of drugs. This is where ICI comes in.

The Pharmaceuticals Division of ICI sprang originally from the Dyestuffs Group at Blackley, Manchester. This was a natural development because the chemistry of dyes is, in general, very similar to that of many drugs. Systematic research directed towards the discovery of new drugs was begun towards the end of 1936, and at first it was concerned mainly with human disease. However, it was only seven years later that a veterinary research unit was set up on a small farm in Cheshire. This had a staff of four veterinary surgeons who concerned themselves with internal and external parasites and bacterial diseases of animals.

One of the first drugs to be studied there was phenothiazine for the treatment of worm disease. This was not an ICI discovery, but our chemists, pharmacists and veterinary surgeons were largely responsible for its development to a point where, at its peak, world production exceeded two thousand tons annually. Considering that the dose for an adult sheep is only 1 oz. and about 2 oz. for cattle, quite a lot of animals have been treated with it over the past 25 years!

One of the first purely ICI drugs was 'Sulphamezathine,' intended for the treatment of bacterial infections of man. It was not long before we found that it was equally effective in animals. Further, it was found to be highly active in the treatment of coccidiosis in birds—a disease that had been a source of enormous loss to poultrykeepers since the beginning of intensive production.

Bovine mastitis is a disease of dairy cows that costs this country the best part of twenty million pounds every year. That is nearly ten shillings for each one of us! Much of it can be prevented by using antiseptics, of which we have shown our 'Hibitane' to be the best.

The disease can be treated with penicillin, and a good deal of our manufacture is used. Penicillin is quite good for mastitis, but it is important that it should not get into our milk supply. If it does it interferes with the manufacture of cheese, or can cause allergies in people drinking it. Therefore the milk given by cows while they are being treated has to be thrown away. In ICI we have produced a formulation which acts very rapidly and then leaves the cow a good deal more quickly than the older forms, thus enabling the farmer to sell his milk sooner than he otherwise could.

The veterinary surgeon as a member of the team helps in a number of ways. First with the Market Research people on the need for a particular kind of drug, discussing its activity with the chemists and biologists and with the pharmacist as to the best formulation and packing for veterinary use. Next come the field trials, in which the drug in its final form is given to practising veterinary surgeons for trial under practical conditions.

Such trials are not always possible in this country. 'Antrycide,' for example, could only be tried out in Africa, and a veterinary surgeon accompanied the research team in the Sudan and East Africa for many months. 'Promintic'—our latest worm remedy—was ready for trial in July, just too late in the year for trial under springtime conditions, so rather than wait for nearly a year one of us took it out to Australia for trial there where the spring had not yet arrived.

We have not finished with a product when it has reached the market. Many drugs need practical demonstration to ensure that the best use is made of them. 'Anavenol,' an anaesthetic for horses and cattle, was one of these, and we demonstrated its use in very many different countries. (The writer claims to be the only English veterinary surgeon to have anaesthetised a one-eyed Russian artillery horse with 'Anavenol' in Finland. The horse had been captured by the Finns in the Russo-Finnish War and was kept at Helsinki for demonstration to veterinary students.)

Complaints sometimes arise even with the best products. They are usually due to misuse, and it is our job to explain matters to the user. This is not always easy. The loss of a pedigree bull may mean the loss of two thousand pounds. The loss of a maiden aunt may mean a gain of that amount—so our job can be more difficult than that of our medical colleagues!

Perhaps the best part of the job is that it is always changing. New drugs keep coming forward, some purely for veterinary use, others for use in man but which can be adapted for animals. Some come to an untimely end—they may be too toxic or too expensive or field results may not live up to those found in the laboratory. But many get through, continually supplying us with new interests, new skills, and new friends in all parts of the world.

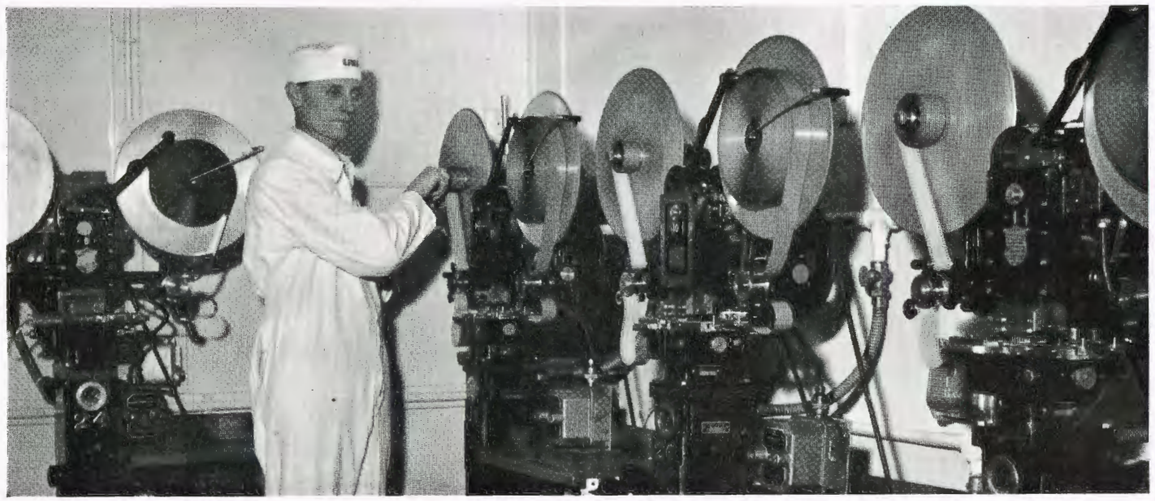
We on the veterinary side have played our part in the development of some thirty new products in the last twenty years—a score that we are proud of. Our colleagues on the research side make it clear that we shall be even busier in the next twenty years.

The 'Mintic' multi-dose set facilitates quick treatment and saves labour costs

Three pairs of twins; one half reared parasite-free, the other naturally infested

It was announced in 1958 that ICI had entered into arrangements with the well-known photographic firm of Ilford Ltd., whereby ICI acquired a one-third interest in their issued ordinary share capital, while at the same time transferring its then existing technical information relating to colour photographic processes and techniques. What kind of firm is Ilford with whom ICI is now associated in this manner?

ILFORD Limited



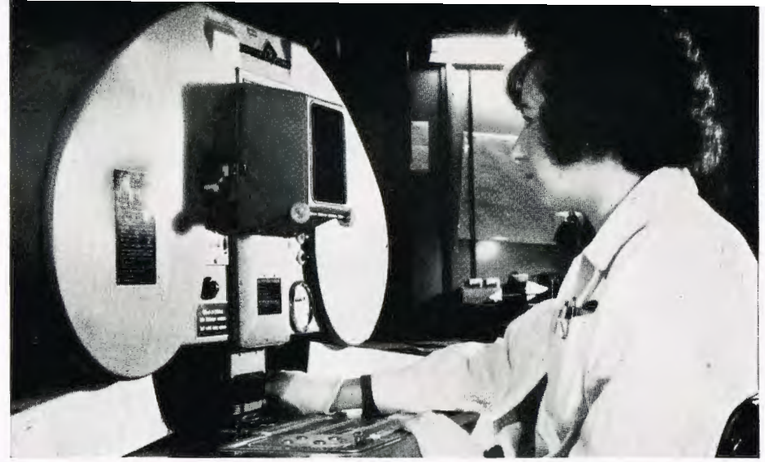
Ilford Ltd. was started in 1879 by Mr. Alfred H. Harman as one of the earliest manufacturers of photographic dry plates. His "factory" was the basement of his own house—in Ilford. Two men and three boys were his staff. At times of pressure, temporary help was provided by Mrs. Harman and their housekeeper. Notwithstanding, the plates were good and the business prospered. In 1891 it had grown to a stage where Mr. Harman deemed it wise to turn it into a limited liability company. By 1898, still further expanding business justified transformation into a public company. It was then called the Britannia Works Co. In 1900 the name was changed to Ilford Ltd. The capital amounted to £380,000.

Ilford's were one of the earliest firms to recognise the importance of serious scientific study in relation to photography and to organise and maintain a top-grade department of research, presided over by a research worker of outstanding ability, the late F. F. Renwick. Over the years many important advances were made, including the introduction of hypersensitive panchromatic and infra-red plates and films, double-coated X-ray films, and Multigrade variable contrast enlarging paper.

Ilford today is more than a household name, it is a world-wide symbol, like Kodak or Agfa, of the highest quality and performance in photography. More than 5000 employees are retained, and Ilford products are on sale practically all over the world. Perhaps the best known, at the present time, of all the Ilford products is its popular colour film—Ilfocolor—a colour negative-positive material—to which the work done by Dyestuffs Division at Blackley, and made available to Ilford in 1958, may claim to have made a substantial contribution. This process has brought good results in colour photography within the range of the veriest amateur.

In addition to supplying the needs of vast numbers of amateur and professional photographers, as well as those of the cinematograph and advertising worlds, Ilford produce a long list of highly specialised products for use in document copying, instrument recording, and both medical (of which particular mention should be made of X-ray films) and industrial radiography.

Provision of a very wide range of sensitised material for every photographic purpose is, however, by no means the full extent of Ilford achievement. Many of the actual uses and applications of photography today have been pioneered by Ilford. Mass radiography, now so widely used as a rapid and accurate method of chest examination, was developed with material assistance from the Ilford Department of Radiography and Medical Photography, set up in 1935. Ilford X-ray accessories are well known. Examination of aircraft structures by radiographic means, whether during production or later in



Right: colour printing at Basildon. The Mobberley factory (below) is the main distribution centre for all Ilford products throughout the North. A substantial proportion of the production of photographic paper is exported from Mobberley to overseas markets. The illustration shows the Packing and Despatch Section of the warehouse, together with a part of the central paper stock. Below, left: An operator perforating 35 mm film at Brentwood

actual service, owes much to the evolution of the various Ilford industrial films. Special emulsions were developed by Ilford at the request of nuclear physicists for use in connection with research into outer space. (A new nuclear particle, the pi-meson, was discovered with the aid of one of these special Ilford emulsions.) Ilford photographic materials, in short, are used by scientists in every branch of research and experiment.

Ilford can also claim credit for a considerable volume of educational work. Frequent courses in X-ray techniques and materials are made open to medical and dental students, and a model radiographic theatre—fully the equal in layout and equipment to those of the most modern hospitals—is maintained for purposes of demonstration and education at the company's Tavistock House premises.

In the document copying field Ilford pioneered in Britain the application of the dyeline process in the commercial (as opposed to the drawing) office. The latest development in this field is the 'Azomatic,' a machine specially designed to produce copies of computer print-out. Another recent introduction, a rapid desk-top copier which produces photographic copies of all documents in a matter of seconds.

Ilford's head office and a number of important departments are still at Ilford, but the main centres of production are now at Brentwood and Basildon in Essex and at Mobberley in Cheshire.

Overseas subsidiary companies operate in Australia, Denmark, India and the USA. In addition, Ilford is represented in more than 100 territories.

Transferring its technical information to Ilford's has not meant that ICI has altogether lost interest in the technicalities of photography. Dyestuffs Division of ICI still maintains a research team of chemists and photographic scientists at Blackley, which works on colour photography on Ilford's behalf and provides one of the means whereby the general scientific resources and facilities of ICI can be made available to Ilford. ICI is represented on the Board of Ilford by Mr. L. H. Williams, a deputy chairman, and Dr. J. Avery, chairman of Dyestuffs Division.

Photography today may be considered the largest of all do-it-yourself enterprises. Astronomic sums must be spent annually by the world's population of snapshotters and amateur movie-makers. The Ilford share of this large amateur market in the UK is approximately:

Black and white 35 mm	75%
Black and white roll film	50%
Colour materials	15%

Of a truth, old Mr. Harman's basement enterprise has become Big Business indeed!

Colonel G. P. Pollitt

by Lord Fleck

George Paton Pollitt, who played such a large part in the development of Billingham as a centre for chemical industry, died on 9th March last at the age of 85. Colonel Pollitt was a member of the original Board of ICI and before the merger had been a director of Brunner, Mond & Co., having first joined that company in 1905 as manager of the Bleach Plant.

His education was broadly based—at school in Belgium, then Manchester and Zürich. Before World War I he was in Brunner, Mond & Co. When war came he joined the army as a motor cyclist in the Intelligence Corps. Later, German attempts to develop a gas offensive gave his activities a different direction, and he was active in the development of a British counter-offensive. Promoted a lieutenant-colonel in this connection, he commanded a special gas corps in the field, which won for him the DSO and subsequently two bars. In all Col. Pollitt was four times wounded and four times mentioned in dispatches as well as being taken prisoner, when wounded, just before the armistice.

After hostilities had been concluded he threw himself with enthusiasm into activities designed to establish a synthetic ammonia industry in Britain, based on assets which the British Government had by this time acquired.

This was the foundation of Billingham, and Pollitt was the man, more than anyone else, who saw in his mind's eye the series of linked chemical plants, complex but logical, which developed in the course of time into the great works which has had such a profound influence on the industrial fortunes of the North-east Coast. He was active in the physical development of Billingham until after ICI was formed, when he moved to London to help in the technical development of the Company. After a few years' activity in such matters, his interest moved to practical farming, first of all in Shropshire and, after the last war, in Rhodesia.

During World War II he returned to ICI to assist in the mobilisation of resources in directions other than chemical. The Blacker Bombard was one such activity, and the PIAT (Projectile Infantry Anti Tank) was another.

In concluding this short note on Pollitt, may I sum up his characteristics: a strong personality, as shown by his ready willingness to lead a technical team and the equal willingness of the team to accept his leadership; a stimulating personality—a discussion with him never failed to spark off some new ideas or a possible new line of development—yet with it all a readiness to listen, particularly to anyone who was actively carrying out chemical operations and taking responsibility. In his staff he inspired loyalty and to them he was in large measure a genius who never received adequate recognition.

As one of a team who profited by inspiration from him, I join my colleagues in the salute we give to the passing of an outstanding figure.

Colonel Pollitt

PEOPLE & EVENTS

A £33,000 ICI solvent degreasing plant of unusual design has recently been installed at the start of the car body production line at the Coventry factory of Jaguar Cars Ltd. The plant is fitted with a rotating mechanism that accommodates two car bodies at the same time. Each is given some three minutes treatment in 'Triklone' (ICI trichloroethylene) vapour while suspended upside down from the rotating platform. The vapour removes completely the coating of anti-corrosive protective material in which the bodies have to be covered for their journey from the Pressed Steel Co. Ltd. at Swindon

Two members of the victorious Widnes team, which won the Rugby League Cup Final at Wembley on 9th May, were Mond Division men. They were George Kemel (left), an estimator in the workshops at Pilkington-Sullivan Works, and Ray Owen (right), a fitter at Castner-Kellner Works. With them is George Stevens (Pilkington-Sullivan Works), who was in the 1930 Widnes Cup team

Some problems of automation

Recently the Chairman gave a lunchtime address to the Northern Counties Branch of the Institute of Directors, during the course of which he made the following observations about automation:

"For a few minutes today," Mr. Chambers said, "I would like to talk about some aspects of the growing automation of certain sections of industry and the problems, particularly in the field of employment and industrial relations, which this creates.

"From the rather flamboyant headlines in some newspapers," Mr. Chambers continued, "one might gather that the age of automation had arrived and that in the near future all efficient sections of industry are going to be controlled automatically, the remaining sections being regarded as declining, decadent, and hardly to be tolerated at all in a modern society. You know as well as I do what nonsense this is, but it is desirable, occasionally, for somebody to say so.

"There is no doubt that industrial production which lends itself to large-scale operation is nearly always more efficiently controlled by modern automatic methods and in a growing number of cases by computers. This is certainly true of most sections of the chemical industrv. and also of other industries producing on a large scale the materials needed by other industries. . . .

"On the other hand, there are industries using the products of the chemical industry where the most economic unit is much smaller and where automatic control of these small units would be uneconomic. . . .

"By small-scale in this connection I do not mean that the factory itself is small; the factory may be a large one containing a number of similar units, the units themselves being small and unsuitable for automatic co-ordination. Large numbers of operators may be employed, but the units of production may still be small and technically separate. Automatic control which may be obviously right for an ammonia plant producing 300,000 tons of ammonia a year *in a single stream* may be obviously wrong or impossible for other production.

"It follows from this that as our national economy develops there emerges a growing variety in the types of productive units throughout industry. The pattern of work in a modern chemical works is, for example, entirely different from that in a motorcar assembly works; . . .

"The nature of the work itself is wholly different in these two cases. . . .

"The pattern throughout industry is immensely varied, from shipbuilding to plastic fabrication, radio and television manufacture, and house-building; some sections lend themselves to highly capitalised methods of production, others being carried on more economically in smaller units in which personal skills predominate.

"With such variety, which I believe will continue, such expressions as the automation of industry, the age of the automaton and the computer are misleading and can lead to errors of judgment.

"I am sure that in our developing economy there will always be an important role for large numbers of small or very small businesses employing in the aggregate a substantial proportion of our industrial population."

Courtaulds and BNS

After several weeks of rumours in the press and in the City the news was released on 27th April that ICI and Courtaulds had reached agreement regarding the future of their jointly owned company, British Nylon Spinners Ltd., and would be submitting recommendations to their stockholders to enable Courtaulds' 50% holding in BNS to be transferred to ICI in exchange for ICI's holding of roughly 37½% of Courtaulds ordinary stock and the payment of £2 million a year for the next five years to take account of the future development expenditure of Courtaulds in the nylon field.

Referring to the announcement at the ICI Annual General Meeting the next day, **Mr. S. P. Chambers** said that the discussions with Courtaulds, which had been going on many months, had been "most cordial throughout." He went on: "We both feel that the terms of the settlement are fair to both sides. As independent companies we shall still have many points of contact, and we have every confidence that we shall be able to work together harmoniously and to our mutual advantage."

Fatal road accident

The *Magazine* records with deep regret the death in a motor accident on 25th April of three members of the Fibres Division, **Dr. E. R. H. Davies** (production and overseas technical director), **Dr. L. Leven** (assistant manager of the technical department) and **Mr. P. A. Gotts** (chauffeur).

Dr. Davies, who was 54, was married with two children. His whole career was with ICI, which he joined at Billingham Division in 1933. During the war he worked on the development of high-octane fuels for aircraft and after the war he was for a time research laboratories administrator, later transferring to the Works as deputy works manager on fertilizer plants, and subsequently to the Oil Works. In 1953 Dr. Davies joined the 'Terylene' Council as works manager designate at Wilton. In 1959 he was transferred to Harrogate as production manager of Fibres Division, and early in 1961 became overseas technical manager. He was appointed to the Board of Fibres Division as production and overseas technical director in January this year.

Dr. L. Leben, 49, was married with three children. He joined Plastics Division in July 1940 as a research chemist, and from September 1943 he worked on the research and development of man-made fibres, firstly as a section leader and later as an assistant manager. He moved to Harrogate in August 1953 as an assistant manager in the Technical Department.

Mr. Peter Gotts, 27, was married with two children. He joined the Fibres Division in May 1960 as a process worker and became a chauffeur in February last year.

Printing success

The Kynoch Press has achieved further distinction in a national printing competition, this time in the 1963 National Photo-Litho and Offset Competition.

Photo-litho, or lithography, is one of the two commoner printing processes, the other being letterpress. (In passing, *Magazine* readers may be interested to know that their magazine incorporates both. The cover, both inside and out, is printed by lithography, and the rest of the magazine is printed by letterpress.)

The Press sent in three pieces of printing to the competition—the 1963 Photo-Litho and Offset Competition—a publicity folder jointly for a paper mill and an ink maker, a wall chart poster for Plant Protection Ltd., and a cover for the Plastics Division's publication *Plastics Today*.

The publicity folder was listed as runner-up for the main award, the Silver Plaque presented by *The Litho Printer*, a technical magazine.

The judges went on to say that The Kynoch Press should be singled out for very special mention because their name was listed by almost all the judges and ranked very highly in other sections of the competition.

The first of the rubber trees being cleared from the Padang Jawa site of the Chemical Company of Malaysia Ltd. In less than 2 years' time this scene will have become the nucleus of Malaysia's chemical industry, producing chlorine, caustic soda and compound fertilizers

Mushrooms galore

Harpur Hill in Derbyshire has attracted a variety of interest in its time. The former ICI Lime Division (now a part of Mond Division) and its predecessors Buxton Lime Firms were interested in it for the limestone which they quarried there until 1944.

Shortly before the second world war the Air Ministry chose it as a location for the underground storage of bombs in wartime. ICI, who owned the land, leased it to the Air Ministry, who spent something like £6½ million cutting eleven tunnels into the side of the hill, which they maintained as a bomb store throughout the war.

Now a new and peaceful use has been found for the tunnels. The Division has recently sold 23 acres, containing the tunnels, to Wrighton Vale Nurseries of Somerset, who propose to grow mushrooms there. When one of the firm's directors inspected the whitewashed tunnels he decided that they would be ideal places for such a purpose.

The firm hope to start producing mushrooms at Harpur Hill early in the autumn.

Malaysian project

The clearing of the site for Malaysia's first large-scale chemical plants has now begun on the new industrial area at Padang Jawa, Selangor.

The plants, which will be operated by the Chemical Company of Malaysia Ltd., an associated company of ICI (Malaya) Ltd., will be manufacturing three main products—granular compound fertilizers, chlorine and caustic soda. Work on the chlorine plant, which will be built by Mond Division, will be completed later this year. The fertilizer plant is expected to start up in two years' time.

The Padang Jawa site—70 acres in area—was chosen because of its central position in Malaya and its first-class communications. It is just off the Port Swettenham/Kuala Lumpur road. The railway runs alongside the site and Port Swettenham is only 10 miles away.

PTFE production stepped up

Plastics Division is to make a big increase in its capacity for 'Fluon' polytetrafluoroethylene, the "slippery" plastic. Current extensions to existing plant at Hillhouse in Lancashire increase capacity to about 1000 tons per year, and new plant, roughly to double this capacity, is scheduled for completion on the same site before the end of the year.

In consumer goods the best known of the uses of 'Fluon' are the non-stick coatings applied to frying pans and saucepans. Many stainless steel razor blades are coated with 'Fluon' to make them friction free and comfortable to shave with. Other uses in consumer goods include oil-less bearings in motor cars, pipe-thread sealants for the plumber and handy man, and cable insulation for electrical appliances.

In 1953, when ICI's first 'Fluon' plant was opened at Hillhouse, the price was £5 per lb. and sales in that year amounted to 9 tons. Since then the price has come down to 27s. per lb. and consumption has risen to several hundred tons per year.

Airhouse exhibition

ICI's stand at the international Plastics Exhibition in France last month took a novel form. Unable to obtain space in the exhibition hall because of priority bookings by regular exhibitors—ICI was exhibiting for the first time—the Company secured the agreement of the organisers for the erection of a 34 ft diameter inflatable airhouse in the exhibition grounds. The airhouse was fabricated from 'Plastolene,' a vinyl laminate reinforced with 'Terylene,' made by Storeys of Lancaster.

The products displayed in the airhouse, all made by ICI in England and sold by ICI (France) S.A., included 'Perspex' acrylic sheet used for signs, lighting fittings, aircraft canopies and windows, sanitary ware and catering equipment; 'Diakon' acrylic moulding materials used for domelights, telephones and motor car equipment; 'Alkathene' (polythene) used for cable insulation, packaging film manufacture and domestic ware; the 'Butakon' range of synthetic resins, rubbers and latices; 'Fluon' ptfe, which has the widest operating temperature range, the best electrical properties and chemical resistance and the lowest coefficient of friction of all plastics; and 'Maranyl' glass-filled nylon, a new plastic with great potential as an engineering material.

Mr. A. R. Foster (left) chairman of ICI (India), retired on 31st March after 31 years' service. Mr. Foster is seen here receiving a silver salver from Mr. A. Keown, managing director of Indian Explosives Ltd. The salver was a gift to Mr. & Mrs. Foster from the staff and workers of IEL

73 year old Mr. Fred Hanks, formerly a waiter in the Directors' dining room at Head Office, was among those who received the Royal Maundy at Westminster Abbey on 26th March from HRH the Princess Royal. Mr. Hanks was sponsored by the Archbishop of Canterbury in recognition of his charitable works and his services to the Church. It is believed that Mr. Hanks is the first ICI pensioner to have been presented with Royal Maundy money.

Binding of 1963 Magazines

The Kynoch Press has again agreed to bind Magazines *for those who would like this done. The cost will be* 13s. 9d. *and anyone who wants to take advantage of this offer should hand in his* 1963 *set to his* Magazine *correspondent now.*

The triplets were delighted by this TR 4 sports car made by Triang from 'Propathene,' ICI's polypropylene. It will take them all. *The strong steel chassis and tough 'Propathene' body will stand up to any amount of manhandling, won't dent or chip, and there are no sharp edges. It is available in red and yellow, costs £9* 19s. 6d. *for the standard model photographed here (de luxe and electric models also), and can be obtained from good toyshops and toy departments throughout the country, including Hamleys and Selfridges in London*

An artist's impression of the ICI stand at the British Agricultural Exhibition in Moscow

On "Little Neddies"

Mr. P. C. Allen, one of ICI's vice-chairmen, and **Mr. C. M. Wright,** personnel director, are two of the members of the economic development committee for the chemical industry recently announced by the National Economic and Development Council. The chemical industry committee is one of five such committees set up, whose task is to assist NEDDY in assessing each industry's progress in relation to the overall growth plan and to consider ways of improving efficiency in their own particular section. The chemical industry committee is under the chairmanship of Mr. G. H. Beeby, chairman of British Titan Products.

On court of enquiry

Mr. E. T. Grint, head of Central Personnel Department, also took on important responsibilities outside the Company as one of the four members of the court of inquiry into the electricity supply industry appointed by Mr. Godber. the Minister of Labour. Serving with Mr. Grint were Lord Justice Pearson (chairman), Professor D. J. Robertson, professor of applied economics and head of the Department of Social and Economic Research at Glasgow University, and Mr. Robert Willis, joint secretary of the National Graphical Association and a member of the TUC General Council.

To Russia–8 cwt. of British soil

Early last month 8 cwt. of British soil was shipped to Moscow destined for the ICI Agricultural Division's display at the Moscow Agricultural Exhibition which opened on Whit Monday.

This particular bit of Berkshire —displayed in two large boxes— may help to boost sales to Russia of the ICI weedkiller 'Gramoxone,' a chemical which can replace the plough, especially in pastures where ploughing is difficult. It kills the green growth of all grass and weeds it touches but leaves no harmful residues in the soil. It is harmless, therefore, to human, animal and bird life.

The boxes of soil illustrated the striking manner in which 'Gramoxone' treatment prevents soil erosion. In one box was soil on its own, representing ploughed land, and in the second box soil and sward treated with 'Gramoxone.' The dead matter becomes a mulch which protects the soil from erosion. 'Gramoxone' also speeds the planting of following crops, as

seed can be sown almost immediately after killing off unwanted sward.

Also on the ICI stand were models of the synthesis gas, ammonia and fertilizer plants that ICI hopes to sell to the Russians following negotiations now proceeding.

New Joint Spanish Company

ICI and Cros S.A. of Barcelona have formed a joint company, CROSICI S.A.—68% Cros and associates, 32% ICI—to manufacture ethylene oxide and ethylene glycol in new plants to be built as part of the petrochemical complex at Puertollano.

The capacities of the two new plants will be 10,000 tons a year of ethylene oxide and 5500 tons a year of ethylene glycol, and they are expected to come into operation by the end of 1965.

ICI is already associated with Cros S.A. and Calvo Sotelo, the Spanish oil organisation, in a joint company, Alcudia, for the production of polythene. This plant, also at Puertollano, is expected to be in operation next year.

Some wild flowers of Britain

To obviate any possible misunderstanding of Mr. David Paton's feature "Some Wild Flowers of Britain" which appeared in the last issue of the *Magazine*, we have been asked to emphasise that the indiscriminate picking of wild flowers, still more the uprooting of rare specimens, is very greatly to be deplored. Most counties, in fact, prohibit under byelaw the disturbance of wild plant life, and special wardening schemes are now organised by County Naturalists Trusts in a number of areas, particularly Upper Teesdale, to protect flowers in bloom. The author was of course aware of this, and mentioned at the beginning of the article that the continued existence of some of the rarer plants was being threatened by excessive persecution. It was his intention to foster more widespread appreciation of the beauty and interest of all the wild flowers, and he assumed a sense of responsibility on the part of readers which doubtless time will justify.

Australian link

An unusual meeting with the descendents of a community his great-great-grandfather helped to establish awaited **Mr. F. P. Hahn,** a welding engineer in Agricultural Division's Engineering Department, when he arrived in Australia recently on Company business.

This took him to ICI Alkali (Australia) Pty. Ltd. at Adelaide. Eighteen or so miles away is the little town of Hahndorf, which has its origins in the arrival there in 1838 of some 200 German Lutheran immigrants brought to Australia by Mr. Hahn's ancestor, Captain Dirk Hahn, then master of a three-masted sailing ship. Captain Hahn negotiated the purchase of land in the Adelaide Hills for his passengers, and in gratitude they named the town after him.

In Adelaide recently, Billingham's Mr. Hahn mentioned his interest in Hahndorf to **Mr. D. R. Currie,** works manager at ICI Alkali (Australia) Pty. Ltd., and Mr. Currie, with **Mr. E. W. Saunders,** the works engineer, accompanied him on a visit to the town.

Mr. Hahn was greeted by some of the town's prominent citizens and shown a memorial erected by the inhabitants to Dirk Hahn. Local historians welcomed Mr. Hahn and there were visits to the Hahndorf Academy, a 106-year old building which was one of the first secondary schools established there for Lutheran children, and the Hahndorf Gallery, site of the first primary school and now an art gallery.

Efforts are being made to establish the Hahndorf Academy as a permanent museum, and Mr. Hahn was able to promise assistance in building up valuable records by making available two log books from the original ship which took the migrants to Australia.

Retirement

Dr. A. H. Lewis

Dr. A. H. Lewis, who retired from the directorship of Jealott's Hill Research Station on the 1st May after thirty-six years' service with the Company, has had a distinguished career in the agricultural world. A graduate in chemistry of Reading University, he spent a brief spell at Rothamsted before going to the Imperial College of Tropical Agriculture in Trinidad. Shortly after his return to England he came to the newly formed Jealott's Hill Research Station. Mr. R. A. Hamilton writes:

Dr. Lewis

All who have visited or heard of Jealott's Hill will immediately think of Arnold Lewis for he was associated with the Research Station from its beginning. Coming to Jealott's Hill as a soil chemist in 1928, Arnold soon established himself as a leading authority at the Station and in the country in the broad field of fertilizers and nutrient uptake of plants. Many of the scientific papers he has published have been on these subjects and were valuable original contributions to the fuller understanding of the processes of plant nutrition and fertilizer practice. He received the degrees of Ph.D. and D.Sc. from London University, in 1944 became Head of the Station and a year later the research director of CAC. Apart from his contributions to research, his qualities of administration and leadership have been a great asset in building up the national prestige of Jealott's Hill. His achievements in research and leadership were recognised by the award of the OBE in 1956.

Arnold Lewis will be missed for his contributions to the agricultural world and for the charm and ease of manner so evident in his contacts with people. His direct approach and sympathic understanding have been appreciated by visitors and staff at Jealott's Hill in both duty and leisure hours for his sports activities in the early days brought him into contact with many local people.

As Arnold and Mrs. Lewis join their son in Australia we wish for them a long and very happy retirement.

OBITUARY

Dr. J. W. McDavid

It is announced with deep regret that Dr. J. W. McDavid, who at the time of his retirement in 1951 was chairman of the Nobel Division, died suddenly on 22nd April 1964. Dr. James Taylor writes:

Dr. J. W. McDavid joined Nobel's in 1912. I first met him in 1928 at an ex-servicemen's fête, where he was busy with a hydrogen cylinder inflating balloons to be released in aid of the fund. This keen human interest and participation in everything that was going on was characteristic of the man. The following year he became works manager at Ardeer. This was a popular choice, for he knew the workers and could speak on equal terms with them. They liked him as a warm personality, sometimes impetuous, but one who understood their point of view. They liked his great interest in sport, especially football, he having been no mean performer himself at Edinburgh University, where later he was awarded a D.Sc., a rather rare distinction in the Company. He was very entertaining and had a delightful pawky sense of humour which reminded me of "Dean Ramsay's Reminiscences." Above all he was a Scot, and looked like a Scot.

In the first world war he served in the RSA, and in the last was seconded to the Ministry of Supply, receiving the CBE for his services to the nation.

From 1945 until he retired in 1951 he was chairman of Nobel Division. His great contribution during this critical period was transforming the Division from its specialist wartime activities smoothly on to a peacetime footing. He realised the dangers inherent in a one-product organisation and was intensely concerned with building up the chemical side of the Division's activities, and its success today is to a large extent due to his efforts. After his retirement he participated in both County Council and Government advisory work for Scotland with his usual enthusiasm and also found time for a great deal of foreign travel.

McDavid, with all his business commitments, was a great family man. Our sympathy goes out to his wife, two sons and daughter.

Dr. J. S. Gourlay writes:

Those of us who remember Ardeer Factory half a century ago heard with great regret that Dr. J. W. McDavid had died. I saw him last at the Nobel Reunion in November 1963, and I suppose I saw him first—at least the impression remains—when he played goalkeeper for the Ardeer football team just after the first war. His popularity then was great, and so it remained throughout a long distinguished career in Nobel Division.

When I joined the Division in 1919 J. W. McDavid was one of a small number of graduates who

Dr. McDavid

were particularly distinguished for the interest and encouragement they gave to very young laboratory apprentices and assistants recruited mainly locally for the expanding research department. He was then an authority on acid manufacture, with an allegedly richly coloured vocabulary, which was put to the test when on a fine August morning I had the misfortune to tip a hundredweight of guncotton mixed acid in a narrow pathway just as he and Jim Weir cycled across it! When the explosive words died away and I had safely collected and delivered to Lab 5 a further quantity, I was more than surprised to find that Mac had taken action to ensure that heavy loads were borne not by 15-year-olds but by good strong nitrators! A special assistant was added to the section. I doubt, however, if this was any compensation for nitrated rubber cycle tyres!

The junior technical training system at Ardeer half a century ago was rigid in the sense that annual examinations had to be passed, together with satisfactory reports in terms of proficiency in the practical work of the various experimental or routine sections, and although I was never assigned to McDavid, it was common knowledge among us, who were infinitely junior, that he was one of the best to be assigned to. Looking back, however, I cannot recall any who were not up to this level, and indeed there was a close and respectful camaraderie pervading the whole that I sometimes think (I hope wrongly) has never been equalled.

Dr. J. W. McDavid was a keen sportsman. The annual Ardeer sports 45 years ago usually found him busy with the organisation of that great day in our lives, encouraging us to train for some event and not caring too much for the result so long as our best was given. In the twenties, when Ardeer Recreation Club was founded, Dr. McDavid was not only an advocate, he took an active part, and many a pensioner has reason to be proud that he knew Dr. McDavid. He will be missed.

Mr. L. G. Sewell

It is announced with deep regret that Mr. L. G. Sewell, who at the time of his retirement at the end of 1949 was chairman of the then Lime Division, died suddenly on 8th March at the age of 77. Mr. L. B. Ryder, Mr. Sewell's successor as Lime Division chairman, writes:

Greville Sewell served with distinction with the Australian forces in the first World War, and later stayed in England to practise as a mining engineer.

Mr. Sewell

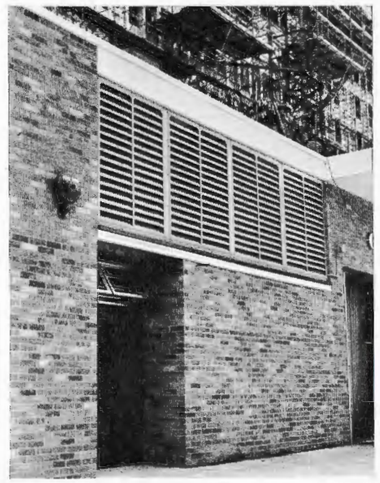
When he joined the then Buxton Lime Firms in 1926 there were some twenty works in operation, most of which had a limited life and somewhat primitive equipment. Life in the quarries was hard and many of the quarry managers were "tough." Where else did one of these local "kings" arrive at headquarters complete with explosives and detonators with the intention of dealing with a troublesome Board?

It needed a big man, and a courageous man, to deal with these problems and to sponsor the long and difficult transition to the concentration of production in a few up-to-date centres. It was a wonderful opportunity for a mining engineer, as the solution depended primarily on the selection and proving of sites capable of major development, each having vast tonnages of high-quality limestone readily accessible for quarrying. Greville Sewell retired in 1949 happy in the knowledge that a greatly increased demand was being met efficiently from three modern works.

To many of us he will perhaps be remembered best for his kindly and never-failing interest in the daily lives and activities of those in the Division, their work and their welfare, as witness his personal interest in the Works Council Scheme and the Company clubs, the stimulus behind the successes in first aid, and the introduction of so many amenities on the Works.

He was a man who had seen much of the world, who liked his fellow men, and made the warmth of friendship felt wherever he went—and, above all, a man who loved his home and his family.

ICI and the Construction Industry (*continued from page 84*)



24 ft. louvred grille made by A.B. Plastics Ltd. from 'Darvic', ICI's vinyl sheet. The corrosion resistance of 'Darvic' means that maintenance is reduced to a minimum

Of Plastics Division it is difficult to write because there is at present such a ferment within the plastics industry in reference to building. Research and development are proceeding apace in all materials in which the Division is interested, e.g. 'Alkathene,' PVC, 'Propathene' and acrylics, and a bright future is seen for these and for other materials not yet in the production range. Of these, rigid PVC is an interesting example. In the UK and in Western Europe the use of rigid PVC for cold-water pipes, rainwater goods, slotted drainage pipes, corrugated sheeting and electrical conduit has developed rapidly over the last few years, and probably 200,000 tons per year of PVC are today being absorbed in these applications, with prospects of further growth. In this development Mond Division's precipitated calcium carbonate, 'Winnofil' S—which improves the impact strength of rigid PVC—should have an important part to play. These products are all new to the construction industry. They have already made significant contributions, but the confident expectation is that these are but indications of greater things to come. ICI has played its part so far—it expects to be to the fore in the future, notably in relation to the new trends towards industrialisation.

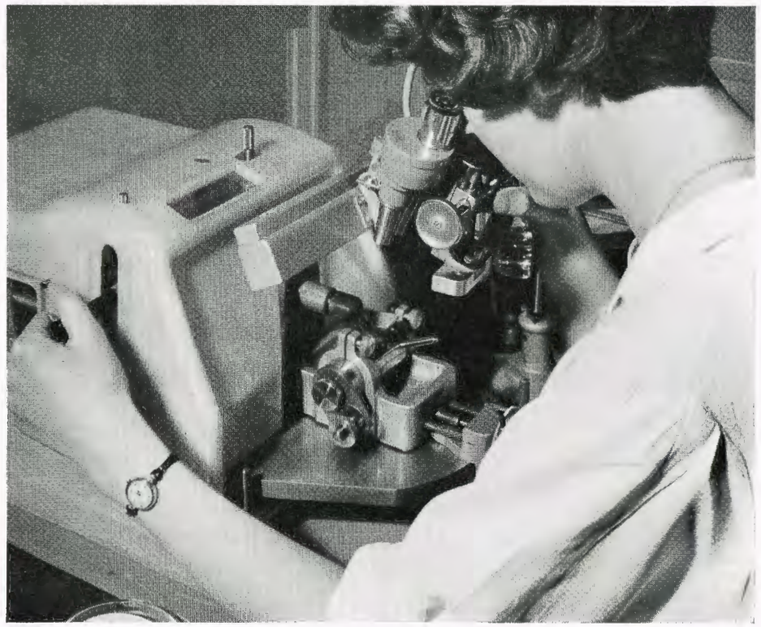
It is hoped that this necessarily brief review will have given some idea of the extensive interest which the Company already has in the construction industry, both in spread and in depth, and of the great activity which is going on in all sectors with a view to deploying its resources yet more widely in the future. It may be appropriate to add that, with the tremendous developments which are now taking place in the allegedly conservative and somewhat backward construction industry, the community as a whole looks to large companies such as ours, which have great resources of scientific and technical skill, to play their part in these developments.

One Woman and her Job

ELECTRON MICROSCOPIST

Patience is more than a virtue for Muriel Whitehurst—it is a necessity. Muriel works in the Research Department of the Pharmaceuticals Division and acts as nursemaid to a very complicated electronic baby—an EM6 electron microscope. It is not the microscope itself which taxes her patience—although, heaven knows, it can be temperamental at times—but rather the handling and preparation of the specimens for examination.

Electron microscopy is a relatively new tool for the research worker, and its use has quite suddenly expanded the scope of scientific investigation. Now, for the first time, we can see things the presence of which could previously only be deduced. The details of intracellular structures, viruses and even large molecules can all be seen and recorded on photographic prints. When examining such small, delicate structures it is obvious that the preparation of the material is vitally important; changes due to the preparation may easily be confused with abnormalities.



The stereoscopic microscope

Most of the material Muriel has to deal with is mammalian tissue, which has to be cut into extremely thin slices before it can be examined. The thinness of these slices can be judged from the fact that it would take about 2000 such slices to make up the thickness of this paper. Before it can be cut, the fragment of tissue (the size of a pinhead) has to be impregnated with a hard resin to support the tissue and hold the sections together once they have been cut. Special knives must be prepared for this delicate work. Some of these, believe it or not, are made from broken glass, for if broken in the right way glass can give a clean, smooth, sharp edge a millimetre or so in length; others are made from specially ground diamonds. The cutting is done on an ultramicrotome and the sections floated on to water, from where they can be picked up on supporting grids. The whole of this operation is so fine and delicate that it has to be controlled by continuous observation through a stereoscopic microscope.

The thin slice of tissue is examined in the electron microscope, which is a highly developed piece of electronic equipment with a bewildering array of knobs and dials. Although the microscope has many built-in safety devices in the form of automatic switches, it is nevertheless possible for problems to arise which could baffle expert electronic engineers for many days. Thus a great deal of responsibility rests on Muriel, and she would be the first to admit that in the beginning she was rather overawed by her charge.

The electron microscopist must acquire a surprising number of skills, for in addition to those already mentioned she must be an expert photographer; not in the sense of getting a good composition (although this is always an asset), but in the ability to get a good print from a series of negatives which differ in density and which may have poor contrast. This part of the work is just as important as any other, for the final observations are made from the photographs, which should show far more than can be seen on the screen in the microscope. The choice of field to be photographed is also of importance and requires knowledge of the detailed anatomy of structures under examination and of the types of artefacts which can occur.

Muriel finds electron microscopy both exciting and adventurous; she may be seeing, indeed probably is seeing, things which have never been seen before and which the vast majority of people can never hope to see. Now aged 25, she joined ICI in 1955. Away from work she has a passion for car rallies, engages in amateur dramatics, is a frequent attender at the Hallé concerts, and has been known to climb mountains and enjoy camping holidays.

S.B. de C.B.

The electron microscope

GARDENERS' GUIDE

by Percy Thrower

It is from now on we begin to see the fruits of our labours of the autumn, winter and spring. While the spring flowers are fast finishing their flowering season, summer flowers become brighter every day and should reach their peak from July onwards. In the vegetable garden there are the first early salads in abundance, with broad beans and peas looking very promising, as well as early potatoes. Those of us fortunate enough to be cutting our own asparagus can continue until about mid-June, when the first peas should be ready to gather. Now is the time to feed the asparagus with organic-based all-purpose fertilizer to encourage strong, firm growth. If this is not strong during the next few months, the plants will not be building up strong crowns to provide next year's cutting.

While we are enjoying the strawberries, the raspberries show every sign of providing a really good crop, and this applies to black currants too. More and more people are planting peaches and nectarine trees on their south-facing walls, but I find that few of these trees are properly trained or kept as they should be, free from pests and diseases. The important point is that they bear fruit on the branches produced during the previous year, and if they are not able to make healthy branches because of aphis and leaf blister they are unable to produce the fruit we would like them to. The trees are now making their young branches as well as bearing this year's crop so be sure they are free from aphis by spraying with 'Abol X' or 'Sybol,' and add 'Tulisan' to either of these to keep peach leaf blister in check. Any affected leaves, those with pinkish-white blisters on, should be picked off before spraying. Spraying will not cure the affected leaves, but it will help to prevent the disease from spreading to others.

How nice a well-trained tree looks to the experienced eye! These trees should be trained to the shape of a fan, and if the process is begun as soon as the young shoots begin to grow, it is possible to make them grow in the direction we want them to go. Disbudding is the first job when the young shoots are an inch or so long. Shoots growing on the front, back or underside of the branches can be rubbed off, leaving only those on top of the branches, and these should be spread out six to nine inches apart. Begin the training by what the gardener calls "heeling" in. This means tying each young shoot to the branch from which it is growing to encourage it to grow outwards from the the centre of the tree or fanwise. As the shoots grow longer they will need further tying, because the tendency the whole time is to grow upwards to the light.

From late June the fruits will be forming their stones, and this is a most critical period. Too much water, or too little, during the stoning period, which normally takes about three weeks, can cause the dropping of the fruit or the splitting of the stones, thus spoiling the quality of the fruit. In early June feed the trees with 'Plus' at the rate of four to six ounces per tree according to its size. This must be thoroughly watered in, because most trees growing near to a wall suffer from lack of water. If a thorough soaking is given no more water should be necessary until after the fruits have formed their stones. When the stones are forming the fruits are usually about the size of a large walnut. After stoning is over, and the fruits have rapidly begun to swell, some thinning may be necessary. To overcrop a tree can also have a detrimental effect on next year's crop. When thinning is finished none of the peaches or nectarines should be closer than six to nine inches.

When the raspberry flowers begin to open, as they will from early June onwards, spray in the late evening with 'Sybol' to prevent the raspberry beetles from laying their eggs and so causing grubs in the fruits. To spray during the daytime can mean damage to the bees, which we need to pollinate the flowers. Feed the raspberries with 'Plus' fertilizer too, for this will not only ensure a good crop but will encourage strong canes which will provide next year's crop. The black currants too will benefit from feeding in June. In March of this year I planted three rows of raspberry canes in my new garden, one row of each of Malling Promise, Malling Jewel and Malling Enterprise. They are now sending up the young canes since I cut them down to within nine inches of the soil after planting. These I am feeding to encourage the strong canes and I look forward to the first crop from these next year.

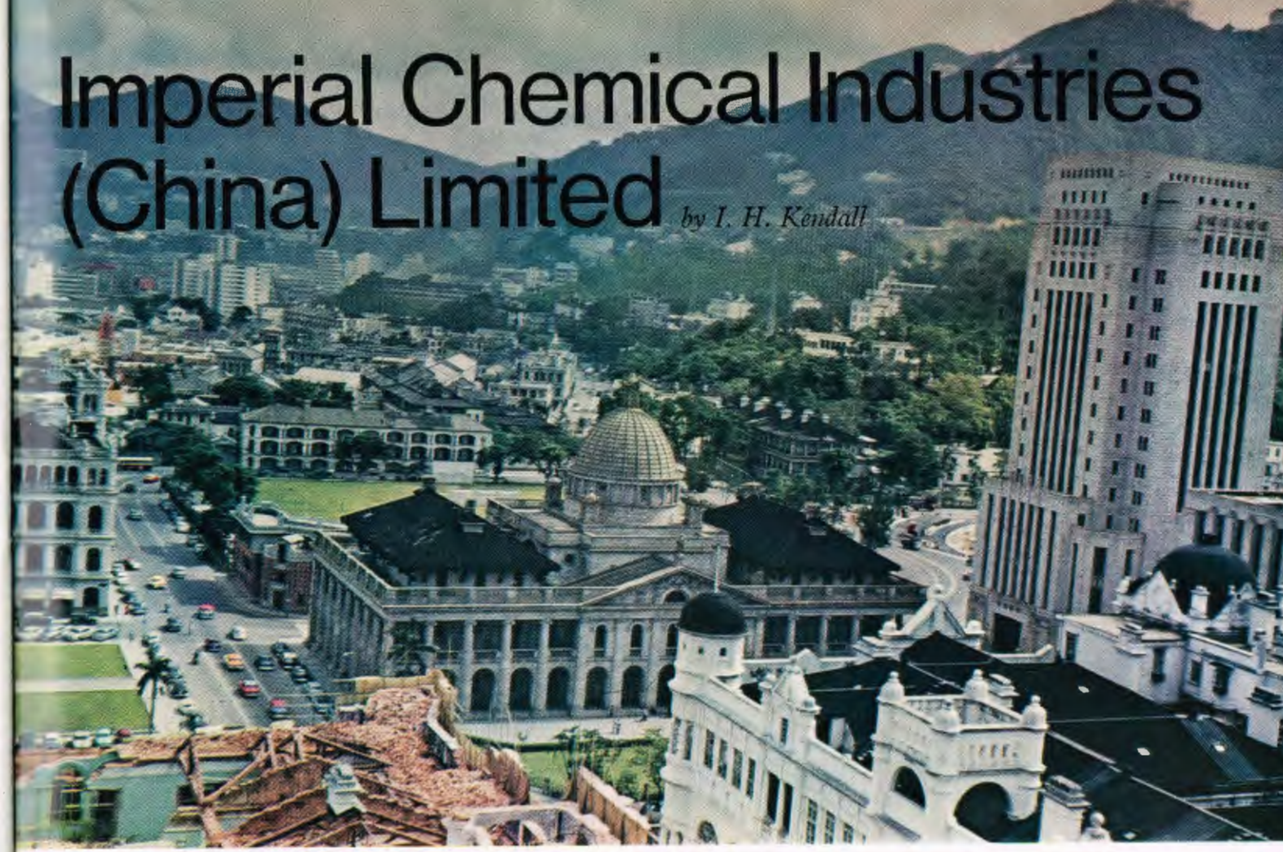
Soon after pruning my roses, which was done in March, I noticed greenfly on the young shoots. This was in contrast to last year, when there was very little greenfly, so I sprayed in April with 'Abol X' and again in late May. The next spraying will be late June, and to the 'Abol X' I shall add 'Tulisan' to keep down mildew and black spot. Now that the roses are beginning to flower it is time to feed with 'Plus' to ensure continuity of flower well into the autumn. Feeding now will make all the difference between good and indifferent roses.

Early June is the time of year I sow seed of wallflowers, forget-me-nots, cheiranthus, double daisies, sweet williams and Canterbury bells. Winter-flowering pansies I sow in boxes around the middle of July, and polyanthus from seed sown in boxes in March are ready for pricking out in a partially shaded part of the garden in June.

There is more seed sowing to be done in the vegetable garden to ensure a continual supply of fresh vegetables into the spring of next year—peas to sow for succession, spinach, lettuce and radish. Further sowings of carrots and beetroot will provide nice young roots from August onwards. As the early potatoes are dug, such crops as globe beetroot and short horn carrots can follow. Leeks can be planted too. Brussels sprouts should be planted in really firm soil before the middle of June, while cabbage Savoy and cabbage January King, as well as purple sprouting broccoli, must be planted before the middle of July. In dry weather runner beans and celery will need plenty of water, and onions growing from sets, seed or young plants will benefit from feeding with 'Plus' fertilizer. Regular hoeing between the rows will aerate the soil, and onions especially appreciate this.

Imperial Chemical Industries (China) Limited

by I. H. Kendall



Brunner, Mond & Co., Northwich, opened their first sales office in Shanghai in 1900. Until 1920 the China offices were controlled by the board of directors at Northwich. However, in 1920, in view of expanding business, a subsidiary company under the title of Brunner, Mond & Co. (China) Ltd. was formed. In May 1928 the name of the company was changed to Imperial Chemical Industries (China) Ltd., our link with the past being retained by our Chinese characters (see page 101), the translation of which is BOO NAY MUN, the phonetic pronunciation of Brunner Mond. Incidentally, the juxtaposition of the three characters has no meaning.

We now employ about two hundred persons in all, including ten expatriates and four technical service staff on secondment from Divisions. Our territory is Hong Kong, China, Korea, Mongolia, Taiwan (Formosa), Vietnam, Cambodia, and the tiny Portuguese colony of Macao. Our head office is in Hong Kong. All our 14 offices in China were closed some years ago. Our affairs in South Korea, South Vietnam and Cambodia are looked after by agents. We transact business direct with the state purchasing organisations in China, Mongolia, North Korea and North Vietnam. The potential market embraces approximately one thousand million people.

Street scene in Kowloon

Our largest single market from the point of view of turnover is on our own doorstep in Hong Kong, where we do upwards of 70% of our business. The emphasis is on light industry, our biggest turnover Division being Plastics. It may surprise readers to know that Hong Kong imported just under 40,000 tons of polythene and 9000 tons of PVC last year. Hong Kong is possibly the biggest producer of

plastic flowers in the world, with about 80% being exported to the USA. We are also an important brass strip and rod market, the former being used mainly in quality torches and the latter in electric plugs, cameras, binoculars, etc. As one would expect, textiles being Hong Kong's biggest industry, we are a sizeable dyes market. An interesting recent development is the processing by local mills of 'Terylene' fibre into 'Terylene'/cotton and 'Terylene'/viscose yarns and fabrics. We are hoping for great things from this project.

ICI (China) is purely a merchanting company at present. To service our markets we have three selling sections, one consisting of dyes, pharmaceuticals and plastics; another, chemicals, explosives, metals and the rest of the ICI products except fibres, which are controlled by a third section. The first two sections also handle some agency products. Each of these sections is under the direction of a sales director, the executive positions being filled by expatriates and senior regional staff. A number of jobs previously performed by Europeans have been taken over by local personnel.

The fact that we do not manufacture in Hong Kong is a deliberate policy despite certain advantages, e.g. low taxation, Commonwealth preference, etc. We have practically no domestic market to fall back on and would have to depend on export markets for the majority of our business. Other inhibiting factors are that we have no tariff protection or raw material and also the very high cost of land. Nevertheless we are constantly on the look-out for manufacturing opportunities.

Now, Hong Kong is one of the most densely populated places in the world. The total area is but 398 square miles, of which only 80 are habitable, including the farmlands of the New Territories. Into the small urban area are crammed approximately 3·6 million people. Industry too is concentrated, which makes market coverage comparatively easy.

Our salesmen spend most of their day out of the office. They sell by industry. Dyestuffs and plastics are sold through distributors, although we do sell direct to some of the bigger factories. Our executive staff, too, spend as much of their time as they can with buyers. Customer visiting is a good deal more popular in the winter than in the summer, when temperatures rise to 95°F and humidity varies from 80% to saturation point. The fact that the whole market is easy to cover causes intense competition. This is aggravated by the fact that Hong Kong is virtually a free exchange market, with the result that competition from practically every country in the world is experienced. Competition from the Japanese in many of our lines of business is particularly severe due to our proximity to Japan, with resultant lower freight costs and quicker delivery. It must be remembered that except for a very few items, e.g. tobacco, spirits, etc., Hong Kong is a free port, and therefore most goods come in free of duty irrespective of country of origin.

We maintain two godowns (warehouses), one on the island and one on the mainland, from which we deliver to the various dealers and factories, and are in the process of building a new godown of five storeys which should be completed by the end of September this year. The origin of the word "godown" is debatable, but one of the more widely accepted versions is that in the early days people had their offices above the warehouses and "went down" to the "godown"! The word is common to India and most parts of the Far East.

As many readers will know, Hong Kong has been experiencing during the past year the most acute water shortage in its recorded history. The Government has asked that water consumption be limited to seven gallons per head per day. In our homes water is available for four hours every fourth day, and we have to store enough water to see us through the period between water days. The water shortage is still a major topic of conversation in Hong Kong, and bath night takes precedence over practically any other social event. The water shortage provides a good excuse for those who like their whisky and gin fairly potent!

There is one social event in the year which I should like to mention. That is our annual BATICI games, played between the British American Tobacco Company and ourselves. They take place over a weekend in the autumn and are in the form of a hexathlon—golf, swimming, tennis, darts (and dinner), and lawn bowls, culminating in a cricket match on the Sunday afternoon. This is an event we all look forward to and is also extremely popular with our medical practitioners, who get a number of new patients on the Monday! Unfortunately, although we have been very near to victory on the last two occasions, ICI (China) has yet to chalk up a win on the overall score.

China is potentially a large ICI customer. Unfavourable harvests during the last few years, resulting in the necessity to purchase large quantities of food grains from Australia, Canada and France, have, however, limited Chinese purchases of products in which ICI is interested. Nevertheless we do a reasonable business with China. We are in almost daily contact with the purchasing organisations in Peking by cable and letter. Contact with other cities is less frequent and business is less substantial than with Peking. Personal contact is made twice a year, when we are invited to attend the Canton Fair in the spring and the autumn. These fairs last one month each, and we usually send three Europeans on overlapping visits, who latterly have been accompanied by Chinese personnel. During these visits we are able to discuss business opportunities, both buying and selling, with our opposite numbers, many of whom come down from Peking. Additionally, the Chinese have agents in Hong Kong. More recently ICI has been successful in visiting Peking, and five such visits have taken place between November 1962 and March 1964. These visits are by invitation of the Chinese. One leaves Hong Kong by rail in the morning, arriving in Canton in the early afternoon, spending a night there prior to flying to Peking the following morning. Of our trade with China, dyestuffs occupy first place, other business covering Fibres, HOC, Mond, Pharmaceuticals and Plastics Divisions.

Taiwan (or Formosa) is a large island about 100 miles off the coast of Fukien province, with a population of about twelve million. Climatically it is not unlike Hong Kong, with a long, hot and humid spring and summer and cool, dry autumn and winter. Here we have a branch office at Taipei in the north part of the island, with a Chinese manager and eighteen other staff. Taipei office accounts for between 5 and 6% of our turnover, about 35% of their business being in dyestuffs and about 15% in plastics. The rest is divided up among the other Divisions and agency trading. Taiwan has been in receipt of American aid for a great number of years, latterly with the "buy American" proviso. This restriction, together with rapid industrialisation in the island, has had an adverse effect on our trade during the last few years. For instance, Taiwan is now self-sufficient in major alkalis, PVC and many other items which we previously sold. She is also a sizeable producer of fertilizers. Last year Taiwan had a favourable overall trade balance. Supplies are drawn from source or often from Hong Kong with the advantage of quick delivery, an important advantage with interest rates at about 20% per annum.

Girls assembling plastic flowers (Photo: Vanda Plastic Flowers factory)

In South Korea our business has been badly hit by the "buy American" policy of AID (Agency for International Development). We had a very sizeable alkali and other chemical business prior to the change, but this has dwindled as the AID dollars are not expendable in certain specified countries, of which the UK is one.

Our affairs in South Vietnam and Cambodia are looked after by a French firm with offices in Saigon and Pnom-Penh. South Vietnam, like Korea, is receiving tied American aid, but we are making very good progress on such items as dyestuffs, which are still purchased with Government funds. Our dyes personnel visit this market quite frequently. Recent developments in South Vietnam have included two military coups since November 1963. A member of our staff was there on each occasion. Fortunately, apart from the excitement, they came to no harm.

The recent edict of the South Vietnam government disqualifying all French firms from getting import licences has not affected our business, as our agents can still make offers to their buyers who apply for their own import licences. As with North Korea, we maintain somewhat tenuous links with North Vietnam.

It is not an easy proposition to give a full picture of our activities in a short article such as this. Our territory extends from the 50th degree to the 10th degree north and covers vastly different peoples, economies and politics. Life and work are exciting and interesting in the Far East.

Twenty years ago, in the month of June, occurred the D-Day landings in Normandy which prefaced the end of Hitler's New Order in Europe. It is singularly appropriate, therefore, that we should publish this account, by one who played an important part in their preparation, of how the all-important weather forecasts for this most historic occasion were made.

'He'll remember with advantages'

The D-Day weather forecasts

by Lawrence Hogben

When a statesman writes his reminiscences, it seems to be accepted that he has, in the course of his duties, retired with approximately half the top secret documents of his time and is entitled to embroider them for posterity. Those further down the line, however, obeying that very statesman's order to leave *all* secret papers behind them, are forced, when their turn comes, to rely on the rosy afterglow of memory alone. But this does make it easier to "remember with advantages." After twenty years there may still be some interest in a few recollections of D-Day and its weather forecasts, which have, as far as I know, not yet been told in any history, official or unofficial.

At the time it was not history, but desperate actuality, that the fate of the West seemed to hang on the possibility of choosing suitable invasion weather. The invasion planners had no difficulty in stating what they required. All they wanted was five days of windless, sunny weather on the beaches, during which, at the order of the air commanders, low cloud would form wherever required in order to give shelter to bombers! An invasion would then be reduced to simple logistics and tactics.

Climatic studies of the actual weather which had occurred over past years in that part of the Channel, however, revealed that nature almost never produced such conditions. There were plentiful records, and in the end it was found reasonable to name conditions which compromised between what allied headquarters wanted and that "up with which they would have to put." The meteorologists thought that invasion conditions might be possible in May or June, but like Philip of Spain before him, Eisenhower found it necessary, for logistic reasons, to send his armada rather later than sooner.

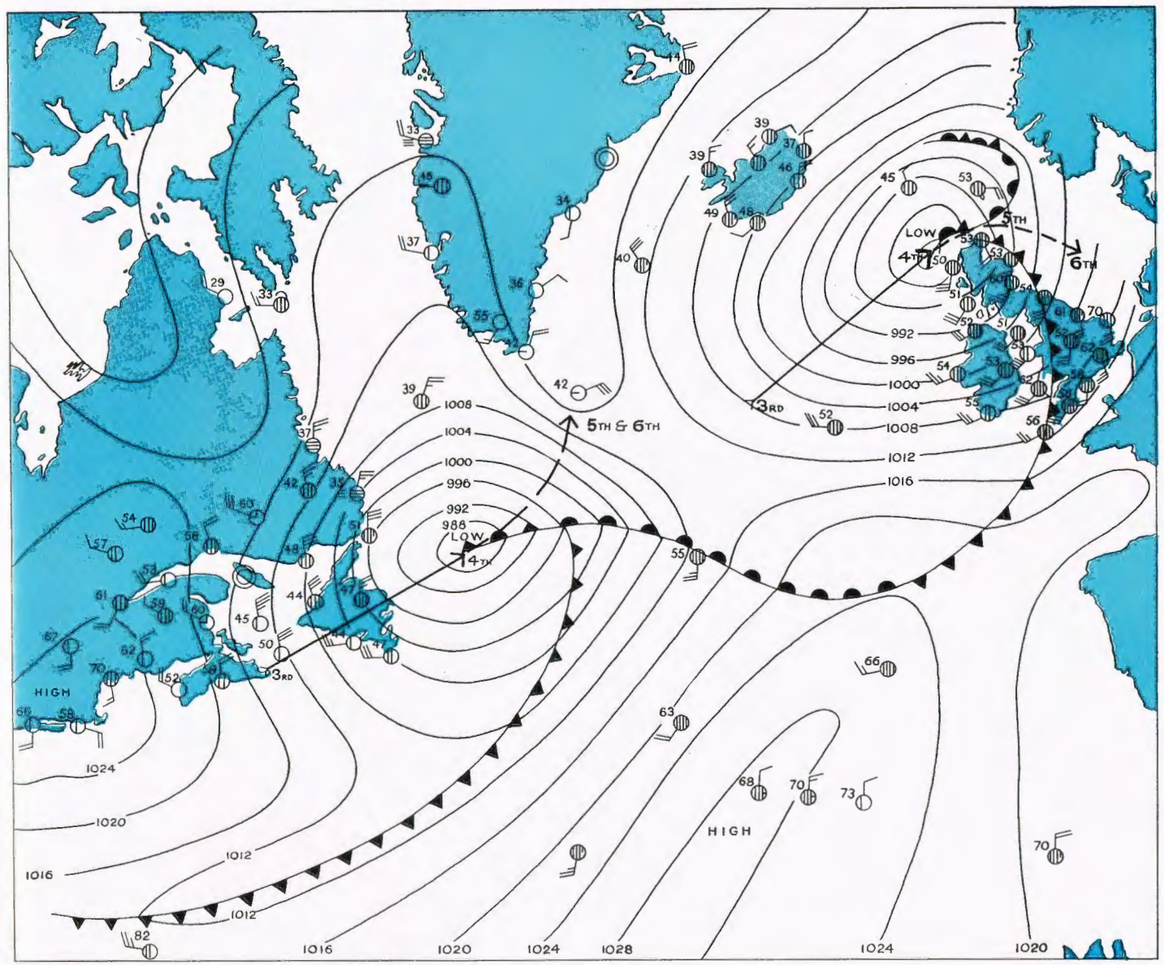
The assault was to take place at low tide, and 5th June was selected as first choice, with 6th June as alternative. Dates a fortnight later, when tidal conditions would be similar, were the second choice should both of the first two days prove impossible.

Eisenhower's headquarters were not suitable for a weather centre, and so, having appointed advisers to interpret the forecasts to him personally and to his deputies, he left it to the Royal Navy, the R.A.F. and the American Army Air Force, as the principals concerned, to agree the forecasts on which he would base his order to launch the invasion. Each had a team of two men which, in its own forecast office, was to analyse identical weather reports, such as were available in wartime. These six forecasters included a senior Meteorological Office man, a Norwegian meteorologist, two Californian forecasters accustomed to the west coast of America, and two Naval meteorological officers—a Cambridge engineer from Hove and an Oxford mathematician from New Zealand. The Naval officers regarded with resigned amusement both the fact that their rank (and pay) were so much less than that of the others and their total lack of success in their efforts to bring this to the notice of the Admiralty, which, as always, regarded without apparent cynicism any Naval Lieutenant as the equal of any Colonel or Group Captain.

On a special telephone circuit the three groups of forecasters, under the chairmanship of Eisenhower's *rapporteurs*, amicably and wordily thrashed out their views twice daily or more, all through the fine month of May preceding the invasion. While these forecasts were being done for practice, and in order to give confidence to those who were going to use them, two disquieting conclusions emerged. The first was that it was absolutely impossible to provide the five-day forecast of the weather which was sought by Eisenhower; and that, effectively, they would have to make do with a 36-odd hour forecast, which is the longest possible stretch for anything like accuracy. The second was that May was turning out so fine that obviously the weather was bound soon to break up, greatly as we might hope that it would not.

The forecasters went to action stations about a week previous to D-Day. As the crucial time approached, it became apparent that the relatively settled weather was gone and that a series of depressions was causing the kind of weather which, except to desperate and determined men, would prove an insuperable discouragement. German forecasters, in fact, are said to have advised *their* commanders that an invasion would not be feasible during the very days when we were straining every scientific muscle to find suitable weather for the allies, and many Germans were sent on home leave in consequence. Of course, the enemy did not have the American data which was part of our weather maps, and had a weather reconnaissance plane only, while we had occasional weather ships. But Hitler had used their vaunted long-range forecasts when invading Poland, and we were therefore to be rather pleased, at this vital time, to prove ourselves a little more reliable.

It was necessary to give the final forecast for weather conditions around dawn on 5th June by, at the latest, early morning on 4th June, because all the decoy convoys and the invasion force itself had to be set in motion a day before the hour of assault. Once they had sailed, there could be no return—the decision would



The weather map of the evening of 4th June on which the forecast for the invasion morning of the 6th was based. The arrows through the centres of the two vital "low"s show the previous 24 hour movement of these depressions (which was all the forecasters knew). The dashed continuations of these lines show where they subsequently moved, i.e. what the forecasters did not know but had to anticipate. Note the diabolical curve of the easternmost depression, knowledge of whose future movement was vital on the 4th to a forecast of Normandy weather on the 6th. This map is based, by permission of the Controller of H.M. Stationery Office, on one which appeared in the "Meteorological Magazine"

be irrevocable. The meteorological problem was that of judging just where a certain depression would move, how deep it would be, and when the bad weather fronts associated with it would pass over the invasion area. Guessing where a centre would be 24 or 36 hours ahead could be done by straightforward extrapolation based on past movements of the depression, but this assumed two things: first, that we really knew exactly where the centre was, and second, that it would not make some extraordinary change in course and speed, or even stop still. Judgment of such matters required then, and indeed still does today, a little more than mere mathematics. 'Hunch,' experience and even wishful thinking were the dangerous but necessary allies of arithmetic. We had a depression in the north-west approaching the Shetlands, and it seemed fairly conclusive that it would be sufficiently deep to cause strong winds in the Channel, while the bad weather fronts associated with it would cause enough cloud to make flying operations impossible. When it came to the critical forecasting moment, however, the Americans, whose inclination was always optimistic, and whose experience was tempered by the fact that they had very wisely only *flown* over the sea, not sailed on it, declared that invasion was possible and that the weather would be reasonable.

The R.A.F., trained to gloom and despondency by years of experience in forecasting English and Norwegian weather, said that this was not the kind of weather they envisaged for an invasion. Our Naval spokesman, Geoffrey Wolfe, now chairman of Wolf Electric Tools Ltd., said that in our view the sea and wind would be a little too bad. Accordingly, by a two-to-one majority we forecast conditions which precluded the invasion. So far so good. This was a difficult decision to make, as well as a disappointing one, and it took a great deal out of those who had to make it; all the more so because it also meant that we had to live with the same agonising problem for another 24 hours

"The Citadel" housed the brain centre of the wartime Admiralty in air-conditioned security under many feet of concrete. In this grim building many naval operational decisions were taken and the Normandy weather forecasts made

and then come to the moment of truth all over again.

Our prediction came true. There was a gale in the Channel, and it was now increasingly clear that the invasion would have to be launched, if at all, in unsettled weather conditions, quite different from the good times of May. And now, for 6th June, a delicate timing problem had to be solved. It was plain that the invasion beaches would be subject to the influence of a depression—at least for a little while. The question was one of degree: how bad would the weather be on the next day's dawn. How well would the depression behave itself? Where would it move? Would there really be a ridge behind the depression? The telephone debate over the details went on furiously, if inconclusively, until the moment came when, from their own weather maps, each of the three pairs of forecasters had to declare a final view. Once more the Americans were optimistic, once more the R.A.F. pair tended towards pessimism, and once more the balance was in the hands of the Naval forecasters, who thought, all things considered, that a sea invasion would just be possible. So by a narrow majority, two to one again, it was decided to issue a "go" forecast. I suspect that Eisenhower was (rightly) not told just how close a thing it was, but if he was, then his courage was all the more to be admired.

Once the forecasters' decision had been taken, the wording of the actual forecast became an exercise in which the basic fact—OK to go—was given but the less pleasant aspects of the weather (inevitable in such unsettled conditions) were toned down to keep up morale. What happened when the forecast emerged and was taken to Eisenhower is well known and has often been recorded.

Geoffrey Wolfe and I came out together for a quick breakfast and asked the paper-man on the corner, as we always did, if there was any news. He said there was a report that we had invaded near Cherbourg, but he thought it was unlikely because it was such a funny place. Exhausted, physically and emotionally, after a fortnight's incarceration in the Citadel of the Admiralty, I went home, and as I came out of the tube station into the sunshine that morning I wondered at people's unconcern as they went to work. How could they be so blasé when the state of the war had changed so decisively, and—which was more important to me at that time—when my wife had presented her absent husband with a son?

There are a number of questions about the D-Day weather forecast which deserve an answer. Could today's forecasters do better? Was telephone conference the best way to decide a scientific matter like this? What would have happened if the forecasters had boobed and issued a second "postponed" forecast?

Whether today's forecasters could do better is rather a controversial point. In my opinion they would do as well, because they have an additional 20 years' experience of the weather, plus their computers to prevent obvious mistakes of extrapolation being made; but progress in this field is still unspectacular.

The telephone conference arrangements seem rather complex and heavy-handed; but they were probably the best possible, because if all the forecasters had been put together in one place, the one with the most dominating personality might have imposed his view on the others and disaster could have followed. As it was, equal weight was given to each of the three groups, and between them they managed to hammer out the right answer; although those pushing the scientific method too far should note that analysis of collections of identical scientific data by three different highly qualified groups led to different answers to the same question.

The invasion type forecasts were continued for a considerable time after D Day, and we therefore know precisely what would have happened on the alternative invasion date a fortnight later. All three forecast groups predicted fine, calm weather. And there was a gale! So if the right answer had not been obtained on 6th June, and the invasion had been postponed, the Allied Expeditionary Force might well have met with disaster. And in that event the whole of Europe might still be enslaved.

June 6th 1944 British soldiers coming ashore on the beaches

Collectors' time-pieces

by Cedric Jagger

Watch by Joseph Windmills of London, ca. 1695. The "sun and moon" dial represents one of several attempts to accustom the public, after ca. 1675, to a watch with two hands instead of one

It has been written: "timekeepers are one of those rare classes of artefacts in which both art and mechanics are combined."

On 28th May the Duke of Wellington opened a special exhibition at the Science Museum in South Kensington entitled "Collectors' Pieces—Clocks and Watches." The exhibits are drawn entirely from the private collections of members of the Antiquarian Horological Society; and this distinction, an exhibition in a national museum, is an accolade to the first ten years of its existence which the Society has accepted with a mixture of gratitude, pride, and a strong sense of challenge. But what, it may be asked in the name of sanity, *is* the Antiquarian Horological Society, and for whom does it exist? Well, a glance at the dictionary will, of course, disclose that horology is the science of measuring time or the principles and art of constructing clocks, dials and the like; and the Society caters for all who find the many aspects of this subject of absorbing interest. Starting with less than a dozen sponsors in 1953, this stripling society of connoisseurs—of all ages, vocations and denominations, but with many younger-generation enthusiasts among them—will certainly elect its thousandth member before 1964 has passed.

Some of the exhibits being displayed come from large and famous collections and are worth thousands of pounds—but there are many drawn from much more modest accumulations, of only small monetary value; yet they all possess some facet of peculiar interest which makes them "collectors' pieces." It is *not* necessary to be a millionaire to enjoy this particular pursuit.

I have had the job of selecting the 120 watches and marine chronometers which appear on display, as well as some of the non-mechanical items such as sundials, sandglasses, rare horological books, prints and manuscripts. These have been drawn from forty-odd collections, mainly in the British Isles, although a small handful of important items have been loaned from the Continent.

The task of selection has been a monumental one. Even though the exhibition

does not set out to trace the historical development of clocks and watches—any competent museum collection will do that—but to show the sort of objects collectors acquire and why, I had nevertheless to achieve some numerical balance between one historical period and another. I had also to take account of those periods when either art or technology was predominant in watchmaking; all-in-all, a job better suited to a computer than an individual. As it was, I started by allocating so many (quite hypothetical) specimens to each half-century from 1550 to 1900; I then wrote a description of what each one should be; and only in the final stage did I set about finding them.

Cart before the horse, it may be said—but thanks to the generosity of collectors in parting with their treasures, the system worked very well. All the periods are adequately represented—almost a miracle in itself, since, for example, the private possession of sixteenth-century watches nowadays is almost unknown. The displays representing certain periods are of a standard rivalling even the most important public collections.

Highlights of the show? I would single out two periods: the so-called "golden age of English watchmaking," the seventeenth century, and the last quarter of the eighteenth century, the early precision period, when technological development was going full blast, and watches could be made to keep time to within a second or two a day.

The first half of the seventeenth century was predominantly an artistic period for horology. Mechanisms were erratic and unreliable and, apart from the mainspring assembly, essentially unchanged from the enormous blacksmith-made clocks of the fourteenth century. So watches were considered mainly as pieces of jewellery, expensive baubles; their cases were often of superb enamel-work, or cut from rock crystal in fantastic shapes, or made from tortoiseshell inlaid with gold or silver—the "coachwork" was handled with prodigious enthusiasm in a variety of materials such as was never to be seen again. By 1675, however, one of the most fundamental inventions in watchmaking had arrived, as we should say now, with a bang—the balance spring. Sometimes called the "hairspring," this device first made timekeeping to within a minute or two a day possible—and perhaps sparked off the stream of superlative craftsmen, such as Tompion, Graham, Quare and Windmills, whose work fetches such high prices today. Plenty of examples of this period—in which English, and particularly London, horologists led the rest of the world—can be seen in the exhibition.

Pocket chronometer of 1798 by Barraud and Jamison

It is worth noting that by 1800 all the inventions essential to really accurate mechanical timekeeping had been made. Did you think, for instance, that the automatic or self-winding watch was a twentieth-century invention? Not a bit of it—plenty of first-quality ones were made in the late eighteenth and early nineteenth centuries, on exactly the same principles as are employed today. Similarly, the lever escapement, upon the proper functioning of which depends the accuracy of your wristwatch, was invented and first applied to a watch by Thomas Mudge about 1770. The only invention of value to watchmakers, in fact, over the last 150 years has come from the metallurgists, with the development of alloys that are more or less impervious to the expansion and contraction caused by changes in temperature—a problem which the watchmakers had tackled long before, and with reasonable success, by using laminates.

And so to the exhibition. In terms of auction prices, the most expensive watches to collect today are those made by that most famous of all French watchmakers, Abraham Louis Breguet. One of his gold "Perpetuelles" (i.e. automatic watches) holds the record for prices at £8000. Breguet combined an elegance of design far in advance of his time with an ingenuity of invention and a standard of craftsmanship which has never been approached before or since. The exhibition includes a whole series of his watches, ranging from the ultra-complicated, with multiple dials and mechanical actions—beloved of the nobility of the time—to the products of his "scientific division," timekeepers of extreme simplicity and elegance coupled to superb high-precision movements.

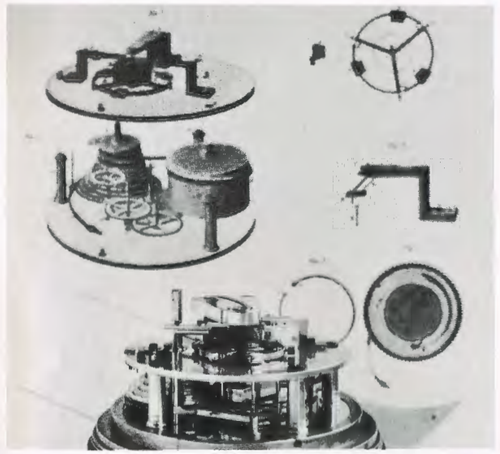
Although the lever escapement was an English invention, most collectors will never in their lives encounter an eighteenth-century specimen, for Mudge disregarded his invention, being preoccupied with other work, and it was some years before other makers took it up and developed it. In fact, the early English lever watch must be one of the rarest in the world—so the exhibition has been truly fortunate in gathering together no fewer than five, all by different makers, as well as an example by Robin, a famous French horologist, which can be dated to 1792, and shows parallel development work on the Continent.

Finally, in this period falls the romantic story of the chronometer. Parliament had shown grave concern at continuing losses at sea due to insufficient navigational aids, and in particular to the absence of any timekeeper capable of performing with sufficient accuracy on shipboard. A prize of £20,000 for solving this problem had been offered. It was won, after a lifetime of work devoted to the project, by John Harrison. But it was left to the leading clockmakers who succeeded him, and in particular to John Arnold and Thomas Earnshaw, to transform his inventions into portable marine chronometers which could not only perform accurately at sea but could be produced in quantity. The exhibition contains a range of examples of the early work of Arnold and Earnshaw, as well as of a number of other chronometer-makers of distinction.

These examples, of course, have only scratched the surface of the exhibition. There are the clocks—a dozen of the finest-quality long-cases (which you and I would call "grandfather clocks") and two dozen spring-driven clocks, suitable for wall brackets or mantelpieces, all from the most interesting periods. Then there are the so-called "Gothic" iron clocks; and a large section of ancillary items such as winding keys for both clocks and watches, interesting old tools, and so on. The exhibition remains on view until 9th August. It is certainly, and in all senses, worth anyone's time to go and see it, and—who knows?—the visitor may leave the exhibition a collector in search of his first pieces.

Many different designs of pocket sundial have been produced. This group dates from the period 1680–1720

photographs by the author



A marine chronometer by Brockbanks, ca. 1815, photographed against its contemporary "blueprint," a steel engraving from Rees's Cyclopaedia, which was produced in weekly parts between 1811 and 1819. This chronometer went on an arctic expedition in 1824–25. Right: A French quarter-repeating "oignon"—so called after its shape and size—by De Lisle of Paris, ca. 1720. The "glass" is, in fact, rock crystal

NANT GWYNANT, *by R. M. Cowan, Plastics Division*